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ABSTRACT

This document is prefaced with a descriptive introduction to the "Access to the Arts Through Assistive Technology Project." The contents that follow are organized in 5 parts. Part 1 includes: "Introduction" (Betsy Foley), and "My Voice Has Wings" (Jeff Moyer). Part 2, "Major Addresses," presents: (1) "Welcome from the Wisconsin Department of Public Instruction" (Tom Stockton); (2) "Assistive Technology: Keys to the Highway" (Jeff Moyer); (3) "The Supportive Relationship between Technology and Human Intelligence in Therapeutic Arts and Special Education" (Dale Taylor); (4) "A Constant Dynamic: The Human-Electronic Future of Learning" (Guy Hubbard); (5) "Providing Access to the Arts through Modification of the Human Interface of Computers and Software" (Gregg Vanderheiden); and (6) "Art, Language, and Disability" (Bruce Baker). Part 3, "Invited Papers," include: (7) "Creativity Unleashed: Access to Art and Music Software through Your Touchtalker/LightTalker" (Chuck Frame); (8) "Breaking Barriers, Integrating Media across the Curriculum" (Colleen Sanders); (9) "Art + Affirmation = Actualization" (Robin Clark-Winright); and (10) "Benefits of Adaptive Technology: A Personal View" (Dale Fuchs). Part 4, "New Technology Reviews," presents articles: (11) Intro to IntroTalker" (Julie Hoover); (12) "If You Can Move Your Head...Head Master" (Julie Hoover); (13) "Let Maps Lead Your Way" (Julie Hoover); (14) "Unicorn-Housing Around" (Mary Trieschmann); and (15) "DynaVox" (Steven Ray). Institute acknowledgments conclude the document in part 5. (MM)

ED 405 258

# New Technology/Assistive Technology and the Arts

# *Institute '91*

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Proceedings of the National Institute

# New Technology / Assistive Technology and the Arts

July 29 - August 1, 1991

Sponsored by
National Endowment for the Arts
Wisconsin Department of Public Instruction
Assistive Technology Project at St. Norbert College

Edited by
Charles R. Peterson

Project Research Assistant
Paula Reinbold

**ST. NORBERT COLLEGE, DE PERE, WISCONSIN**

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**ACCESS TO THE ARTS**
**through**
**ASSISTIVE TECHNOLOGY**



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**NEW TECHNOLOGY/ASSISTIVE TECHNOLOGY AND THE ARTS**

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## PREFACE

### THE ACCESS TO THE ARTS THROUGH ASSISTIVE TECHNOLOGY RESEARCH PROJECT AND THE YOUNG ARTIST WORKSHOPS AT ST. NORBERT COLLEGE

The Young Artists Workshops Program (YAW) is many things: (a) an interdisciplinary arts program, (b) a research and demonstration site, and (c) a teacher training program. Perhaps most importantly, it is a program that gives to young people with disabilities an exciting and frequently first in-depth encounter with the visual and performing arts. We believe every child, regardless of the disability, can enjoy some aspects of the arts if suitable adaptations are made to increase access to the various art forms.

Founded in 1985, it is in its eighth year of providing a three-week full-time program for visual and performing arts experiences for disabled youth in Northeastern Wisconsin. Program participants range in age from 3-22, and most disabling conditions encountered in the schools are represented.

The Program combines our disabled, but most capable, young artists with a dedicated staff of over 60 professionals representing many areas of expertise. Visual artists, musicians, dancers, photographers, and actors combine their talents with arts educators, therapists, and special education staff that are drawn to the Program from several states (and even other countries, such as England and Germany) to participate in this unique encounter with the arts.

In addition to providing a summer arts experience, the YAW provides a program of year-round teacher training and retraining to help arts educators increase their abilities to work with disabled young people that are mainstreamed or integrated into the regular classroom.

YAW is also a research and dissemination site that has been supported by major grants from the National Endowment for the Arts--Polaroid, Kodak, and IBM--to develop techniques for increasing accessibility to the arts. Its activities include developing materials for teacher training, consulting with area school districts and agencies, publishing resource materials, producing video tapes, conducting workshops and institutes, and making presentations at a variety of professional educational conferences throughout the United States and Canada.

Publications have included photography, visual arts, and music resource guides to help educators identify important resources for improving the instruction of the arts with disabled youth. It has also developed instructional television teacher resource materials that have been professionally produced and are being distributed nationally and internationally. These have included Access to Photography for the Physically Challenged (video and book), Visual Arts and the Physically Challenged Person (video and guide), and a new video, If You Can Move Your Head, You Can Move Your World: New Applications For Assistive Technology. Materials are distributed internationally by the Agency for Instructional Technology (AIT), and Video Education Australia (VEA).

Project staff have served as consultants for area school districts and the Wisconsin Department of Public Instruction in developing curriculum resource materials for arts and the exceptional education needs (EEN) student. The Wisconsin Association for Physical Education; Health, Recreation, and Dance; the Wisconsin Arts Board; Wisconsin Heart Association; and United Way have underwritten several experimental programs bringing together the talents of physical therapists, movement therapists, adaptive physical education specialists, and dancers to develop creative movement activities for young people who are physically challenged.

The child with limited physical coordination can operate 35 mm, instant print cameras, and video camcorders to record, interpret, or share images with an audience with which communication was previously impossible. Collaborative research projects in media arts have been supported since 1987 by Kodak and Polaroid, and in 1990 by Photographic Education Group (PEG) in England.

The summer Young Artist Workshops Program has become a practicum for continued education and teacher training in Adaptive Education and the Arts, and Adaptive Education: Assistive Technology, two new teacher certification options. The Program also conducts an annual series of workshops for area educators in cooperation with area school districts, Cooperative Education Service Agencies of the Wisconsin Department of Public Instruction, and area human service agencies. A new program entering its fourth year conducts pre-service and in-service training for special education instructional aides in cooperation with area school districts.

Our young artists become both our students and our teachers as we develop our skills and assist other teachers to better meet the needs of our most gifted and most capable, although disabled, young artists. Since 1985, over 600 young artists who happen to be disabled have participated in summer YAW programs. Over a thousand teachers have also participated in workshops, conferences, seminars, and institutes that have been part of the YAW outreach.

The most ambitious and innovative project in its seven years of existence has been a major on-going research effort supported by the National Endowment for the Arts, IBM, the Prentke-Romich Company, Don Johnston Developmental Equipment Company, North Shore Computers, Connecting Point Computer Center, area education agencies, the Wisconsin Department of Public Instruction, and the St. Norbert College community. The Access to the Arts Through Assistive Technology Project develops means for the non-vocal, physically challenged, or multi-handicapped individual to gain access to the visual arts, music, and creative writing through computer communication systems with off-the-shelf software and standard computer equipment. The non-vocal child without using his or her hands can still compose music, perform, or sing electronically. The physically challenged child without the strength to lift an arm or control to use a finger can look at or talk to the computer screen and produce computer art or do creative writing. Field testing of keyboard overlays, setups, and varied interface devices has been conducted in the Green Bay Area Public Schools, in the summer YAW programs, and at a local Cerebral Palsy Center. Intensive instruction took place with physically challenged students and persons with communication disorders during the 1990-91 summer YAW. The project culminated in a package of overlays, interface device setups, and an instruction manual that is being disseminated nationally to help provide access to the arts through assistive technology. The companion professionally-produced video tape mentioned earlier, *If You Can Move Your Head, You Can Move Your World: New Applications For Assistive Technology,* is also available through the YAW.

A second major project accomplishment was organizing the National Institute: New Technology/Assistive Technology and the Arts, which brought together the leaders in the area who are represented in this Institute Report.

We are grateful to the many supporters of our project, the dedicated professional staff, the parents who generously shared their children with us, the St. Norbert College community, and particularly to Chuck Frame, an Assistive Technology Specialist in the Green Bay Area Schools, whose imagination, ingenuity, and dedication helped make this Assistive Technology Project a reality.

Charles R. Peterson
Professor of Art and Education
Director of YAW
St. Norbert College
November, 1991

**Charles Peterson**

Charles Peterson, Professor of Art and Education at St. Norbert College, is also Founder and Director of the Young Artist Workshops (YAW). YAW is a program of visual and performing arts experiences for disabled youth in Northeastern Wisconsin. He also directs the Access to the Arts through Assistive Technology Research Project. In addition to his work with assistive computer technology, Peterson also develops print and instructional television teacher resource materials on photography and visual arts access for persons with disabilities.

## INTRODUCTION

Betsy Foley

## STILL BREAKING NEW GROUND

Innovations in technology expands YAW dimensions; offers greater access to the arts for people with disabilities.

In 1985 the Young Artist Workshops was called Arts for Special Children, an experimental summer arts enrichment program for children with disabilities; enrollment was limited to 20 children with physical disabilities and/or communication disorders; and the teaching staff consisted of founder-director Chuck Peterson, one lead teacher and her assistant, a handful of student assistants, and a half dozen or so local guest artists, most of whom volunteered their time.

Today, just seven years later, 130 young people ages three to 22 with a wide range of physical and mental disabilities enrolled in the 1991 summer program; over 600 potential young artists with disabilities have participated in the summer program since 1985.

The summer staff has grown to more than 60 professionals and volunteers, with guest artists from several states, as well as England and Germany, many of them nationally and internationally known.

Year-round teacher training for arts educators provides certification or training workshops for several hundred teachers annually.

A plethora of educational resource guides on adaptive photography, music, and visual arts, training manuals, and videotapes are distributed nationally and internationally.

Project staff are consultants for school districts and the Wisconsin Department of Public Instruction developing curriculum materials for arts and the exceptional education needs' student.

The impact? An ever growing number of young people who are no longer denied access to the arts because of their disabilities.

"YAW is like an iceberg with only one-seventh of it (the summer workshop) visible above water," says Peterson, a St. Norbert art and education professor.

The application of technology expands the dimensions of the

iceberg still further. A new project entitled, "Arts Access Through Assistive Computer Technology" now brings experiences in the arts within the reach and capabilities of all children. YAW director Peterson and researcher Charles Frame, a speech and language pathologist and assistive technology specialist with the Green Bay Public Schools, created a unique program testing the use of augmentative communication equipment. The on-going research project is the first known of its kind to explore the use of computer and augmentative communication system technology to access the visual and performing arts by youth who are non-vocal, physically challenged, or multi-handicapped. Peterson calls it "the most ambitious and innovative project in its (YAW) seven years of existence."

Using standard augmentative communication systems and computers typically found in schools, the researchers have developed new software programs and ways to interface with existing systems have been developed. An expanded keyboard and Adaptive Firmware Card enables faster and more accurate computer access by persons whose limited fine motor coordination precludes them from using the standard computer keyboard, Peterson says. The keyboard may also be modified for use by a person without vision or with limited vision. Software activated by an infrared light source, by ultrasound, or by pointers strapped to an individual's forehead is among the special adaptive equipment used, enabling the user with disabilities to write, draw, paint, compose, or perform music.

"The non-vocal child without using his hands can still compose, perform, or sing electronically," Peterson says. "The physically challenged child without the strength to lift an arm or the control to use a finger can look at or talk to the computer screen and produce computer art or do creative writing."

Field testing of keyboard overlays, setups, and varied interface devices were conducted in the Green Bay Area Public Schools, in the summer YAW programs, and at the Green Bay Cerebral Palsy Center. Intensive instruction took place with physically challenged students and persons with communication disorders during the 1990-91 summer YAW. The result was a package of overlays, interface device setups, and an instruction manual for national dissemination to help provide access to the arts through assistive computer technology. A professionally-developed videotape, *If You Can Move Your Head, You Can Move Your World: New Applications for Assistive Technology*, is among the resources developed within the past year and will be distributed nationally.

"We really have something innovative going on here - a very advanced application of technology to the arts,"

Peterson says. Among the developments are 13 overlays that fit on a computer keyboard enabling the user to draw, paint, and/or sing.

The Arts Access program has unlimited potential, Frame says. Creating awareness about an individual's capability in art and music is a primary value within the program. People with handicaps may have gifts not previously tapped. Assistive technology enables such people to express and experience their talents for the first time.

Training workshops for art and music teachers began in February 1990; a four-day training program for art, music, speech and language personnel involved in YAW's summer arts program was held in June 1990.

A highlight of the 1991 summer program was a national institute, "New Technology/Assistive Technology and the Arts," held on campus July 29-Aug. 1. The institute drew about 80 arts and special educators, speech and language pathologists, and administrators from the Midwest, Pennsylvania, Florida, Montana, California, and Japan. Thirty of these earning college credit. Workshops, exhibits, and demonstrations of assistive technology demonstrated techniques providing creative access to the arts for disabled as well as non-disabled people.

"It's the first conference of its kind," Peterson says, "the first time art, special education, and technology have come together in this fashion."

Peterson says the national institute acted as a catalyst bringing interested people together to learn and experiment. "It (institute) provided the opportunity to share with other professionals the creative potential for accessing the arts with computers and assistive technology," he says. "At the same time, it was a showcase for YAW and the innovations arising from our own NEA and IBM supported research project," Peterson adds.

The program agenda featured five addresses by national leaders on new applications of technology. Hands-on workshops conducted by exhibitors and program sponsors provided opportunities to experience creative applications of the new technology as did visits to the YAW program activities. Performances by artists with disabilities emphasized the accessibility of the arts to all people.

"It was the institute's purpose to emphasize the accessibility of the arts for everyone," Peterson says, "and to challenge artists, educators, and therapists to provide opportunities for creative expression to disabled students and clients. I believe we were effective in achieving that objective."

Co-sponsored by YAW and the Wisconsin Department of Public Instruction, the institute was supported by the National Endowment for the Arts and IBM and Cooperative Education Service Agency #7 (Green Bay WI).

## YAW Funding

The research program is supported by a $30,000 Special Projects grant from the National Endowment for the Arts (NEA). The St. Norbert program is one of only two in the country to be funded by the NEA's Arts in Education Special Projects Program. The grant was used to develop a computer lab adapted for use by young people with disabilities. St. Norbert and YAW have received previous NEA grants totalling more than $100,000, supporting YAW development and the Arts Access Project.

Other support for the research project came from IBM, the Prentke-Romich Company, Don Johnston Developmental Equipment Company, North Shore Computers, Connecting Point Computer Center, area education agencies, and St. Norbert College.

**My Voice Has Wings**
**by Jeff Moyer**

This song has been written on behalf of the hundreds of thousands of individuals who have been denied speech by their physical disabilities. Until today, their silent songs were not heard. Through the magic of the tools now available however, not only can they speak, but for the first time, they can truly sing.

1. There are walls of solid granite,
there are walls of brick and steel.
There are walls that people build inside,
that disguise the way they feel.
But of all the walls among us,
there is no so hard and cold.
As the one that locks a voice inside
silent thoughts are never told.
CHORUS: My thoughts can soar my voice has
wings for years my voice was locked away,
now I can sing
Hear me now hear me now, hear it ring!
2. Locked behind the walls of silence
feeling helpless and alone.
We have known the yearning hunger
for a voice to call our own.
Now we have that key to freedom
now the gate is open wide.
No more captive in the silence
Free now from the bonds inside.
CHORUS
Bridge: Birds are meant to take to wing
yes birds are meant for flight.
And we are meant to join our thoughts
for language is our right.
This age has given us the skies,
our tools have let us soar.
And now the age has given speech
together we explore!
3. Take this tool this bridge to freedom
Help me build my way along
Every voice deserves a channel
Every voice deserves a song.
Through its power we touch each other
Thoughts and questions, stories, songs.
Hear the walls of silence crumble
Through our language we belong.
My thoughts can soar my voice has wings
For years my voice was locked away
Now I can sing
Hear me now hear me now Hear it ring!

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**WELCOME FROM THE**
**WISCONSIN DEPARTMENT OF PUBLIC INSTRUCTION**

Tom Stockton

On behalf of Dr. Grover, State Superintendent of Public Instruction, I would like to welcome you to this co-sponsored institute dealing with new and assistive technology and the arts.

Chuck Peterson, who envisioned and has directed the Young Artist Workshops, is primarily responsible for this institute which brings to Wisconsin a number of outstanding nationally recognized leaders who will address different areas of the arts. St. Norbert College staff have adapted voice activated computer systems for use by music and arts instructors so they can be utilized by students with disabilities. You, as participants, will also have hands-on opportunities for developing skills with a variety of adapted pieces of equipment and observing the use of the equipment by students with disabilities.

In addition, numerous tools of the various arts will be modified or adjusted to make it possible for many students who have different disabilities to actively participate and receive personal satisfaction in their music and visual arts programs. High technology, low technology, and no technology - just modifications - are all part of these four days.

For several years, the Department of Public Instruction state plan to serve children with disabilities has identified INNOVATIVE USES OF TECHNOLOGY as one of the state superintendent's major priorities for the use of federal discretionary funding. Some very interesting projects have been initiated and developed by local districts and cooperatives. These have resulted in exciting opportunities for students with exceptional educational needs. Some of the results from these technology projects have included

- more effective instructional programming
- the establishment of personal support systems
- workshops, inservices, and dissemination of information on technology.

Children who previously were delayed in completion of class assignments or who were unable to finish tests, some who were "on the outside looking in" because they could not communicate effectively might not be included in group activities and social events, and some who might be considered incapable of transitioning from the public school instructional programs to post-high school

education and community activities have achieved dramatic success.

Both federal laws - the Technology Related Assistance for Individuals with Disabilities Act and the Individuals with Disabilities Act, often referred to as I.D.E.A., define "assistive technology device" as

> "any item, piece of equipment, or product system, whether acquired commercially, off-the-shelf, modified or customized, that is used to increase, maintain or improve functional capabilities of individuals with disabilities."

In like manner, these federal laws define "assistive technology service" as:

> "any service that directly assists an individual with a disability in the selection, acquisition or use of an assistive technology device."

The definition goes on to name seven areas of services that will be available through assistive technology. These two recent federal laws, along with the Americans with Disabilities Act, will most certainly influence consideration of and increased utilization of many types of assistive technology for people with disabilities.

Recently, Mr. Contrucci, Assistant State Superintendent for the Division for Handicapped Children and Pupil Services, responded to a letter concerning a school district's responsibility regarding assistive technology. The basic question was how do these definitions fit within the framework of the laws applying to children with disabilities. I would like to cite a few statements from that letter.

"...To understand the application of these definitions we must examine the basic requirements of the federal I.D.E.A. legislation and state law. ...School boards are required to provide a free and appropriate public education to children with disabilities. ...Related services include transportation and such developmental, corrective, and other supportive services as are required to assist a child with a disability to benefit from special education. ...We agree with the position of the U.S. Department of Education, Office of Special Education Programs, that assistive technology devices or services could be available as special education or related services based upon their definitions.

...The question of when a school district is required to provide either assistive technology devices or services as special education or related services depends upon the

needs of the individual child. ...It is the department's position that a district is required to provide assistive technology devices or services when they are needed to permit the child to receive an educational benefit and, therefore, to receive a free and appropriate education. ...Assistive technology devices and services may also be a supplementary aid or service within this context. ...Again, the individual child's needs dictate whether a particular supplementary aid or service must be provided."

The letter goes on to state: "...a district or public agency may not presumptively deny assistive technology to a child with EEN (16 IDELR 1317)...a decision concerning the provision of assistive technology must be made on an individual basis. This decision is made by the participants in a meeting to develop the child's IEP. The same holds true for any "methods" or "procedures." A child's IEP must be reasonably calculated to provide the child an educational benefit. If the participants at the IEP meeting determine that a particular method, procedure, strategy, or intervention is required in order for a child to have a program that is reasonably calculated to provide the child an educational benefit, then that method, procedure, strategy or intervention is included in the child's IEP."

Henry M. Levin, Professor of Education at Stanford University, is a proponent of the Accelerated Schools Project. He contends that we should look at every child as gifted and talented - observing, citing, and building on the individual child's strengths instead of weaknesses - in order to help the student achieve educational progress. This works as well with children who have identified disabilities as with those who are at-risk, average, or gifted.

Instead of concentrating on all the things which are wrong with a child, this institute will help you look at the needs of an individual child which can be addressed through some degree of technology. You will be able to offer additional opportunities for children to grow creatively, intellectually, aesthetically, and socially.

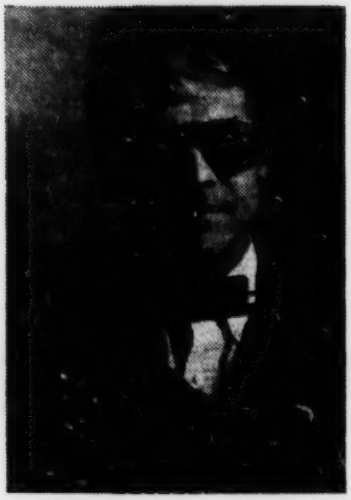
I am sure that you will have an enjoyable and productive week. We look forward to the anticipated positive results and hope you will share with us some of your experiences as you use this training in your professional responsibilities. Three additional members of the department (Mel Pontious, Music Education Consultant; Betty Ross-Thomson, Consultant for the Physically Handicapped and Other Health Impaired Programs; and Barbara Leadholm, Consultant for Speech and Language

Programs) will be with you this week, both as presenters and participants.

In closing, I would like to quote Robert R. Williams, Editor of Assistive Technology Quarterly, "Assistive technology is neither magic nor a panacea. But, assistive devices certainly can be powerful tools which people with disabilities of all ages and varying backgrounds can use to successfully meet head on everyday life challenges. Assistive technology alone will never completely eliminate the added difficulties and challenges which come with having a disability in our society. Increasingly, though, it is becoming one of our most effective allies and change agents for doing so."

Thank you for your attendance.

Mr. Tom Stockton
Section Chief/Supervisors
Wisconsin Department of Public Instruction



**Jeff Moyer**

Jeff Moyer has been writing and singing songs about disabilities for 20 years. His music has been featured on the CBS Evening News, in a BBC documentary, and in a national teleconference on augmentative communication, sponsored by the Department of Education. Based on his musical contributions to disability awareness, and his program development work, he was inducted into the National Hall of Fame for Persons with Disabilities in 1989. As Director of Rehabilitative and Educational Services at the Cleveland Sight Center, he created the recognized model, focuses on training and engineering support, so visually impaired adults can train with technology to become viable job candidates in more fields than ever before.

# ASSISTIVE TECHNOLOGY: KEYS TO THE HIGHWAY

Jeff Moyer

It is significant to me that this conference is happening at all. The fact that we are gathered together to consider the arts as an important topic speaks volumes about how far we have come in our ability to see the real human issues about the education and quality of life of individuals with disabilities. Disability brings so much attention to the survival issues; basic education, critical communication, basic mobility, survival of independent living skills - who has had time to think about the arts? Is it that we have gained a cushion, a comfort zone between the musts and available energy, or is it that we have recognized that in the arts we find the heart of human expression, the kernel of our humanity, and the quintessential hallmark that makes life worthwhile? I suspect it is the latter, and that we also recognize that we now have the tools to open new options of expression which make access to the arts possible in ways never before imagined. But let's not be guilty of the sin of technograndia. The technology is only a part of the equation that we need to concern ourselves with, and it is the broader context that I would like to discuss.

Application of technology for artistic purposes should be considered as first and foremost the application of technology itself, requiring careful and knowledgeable selection, thorough training, integration considering many non-technical factors, including the comfort of the individual and the specific need. As a child, I lost vision gradually to the point of being referred to a low vision clinic, a new program concept in 1960. Although the telescopic magnifying aid that I was prescribed worked wonderfully clinically, I was ashamed and embarrassed to use the tool for any application outside the immediate family circle. These feelings nearly completely limited my use of the device, although it would have been valuable in many settings including school, spectator sporting events, and numerous recreational activities. Had my feelings been considered, and my right to feel them affirmed, I might have worked through my response and could have integrated the power of the optical technology more quickly into my life. Perhaps the overriding issue here is that <u>the individual</u> needs to be at the front of the technology-related team; and his or her feelings, interest, and goals must be considered prior to technology selection, training, or integration.

Allow me to share an amazing historic perspective with you. In 1980, I was project team leader on a National

Science Foundation-funded project evaluating the state-of-the-art of voice output. The system took a van to move in its seven crates as we delivered it to the home of Michael Williams, a colleague I had known through my earlier work at the Center for Independent Living in Berkeley, California. Michael has cerebral palsy and his speech is severely impaired. To that point I had enjoyed Michael's company but only spoken with him through an interpreter who re-spoke his utterances or read his painstaking pointing at a simple letterboard. We installed the system, taught Michael to use it and left. We returned some six weeks later to see how it had gone. I had expected him to use the system for serious endeavors expressing matters of consequence to those in his life. He certainly did that, but in addition, he used the system as a tool for play and artistic expression. His use of the system included numerous real-time and taped expressions which included genuine "heart talk" as well as humor - the playful expression of his whimsical and creative view of the world. That was art in its most profound form and the technology was his key to the highway.

But in addition to that and other consumer uses of our lab system, we studied what current technology (circa 1980) could not do and we wrote up some design criteria which we set out as a challenge for future development. Among the things that we stated were the requirement that systems of the future include voices that were age and sex specific, and that could express communication other than straight speech, including singing. That seemed very blue sky at the time, and it was with a sense of trepidation that I included such far-out future requirements to the NSF.

I have worked closely with Prentke-Romich Company, world leaders in assistive technology for producing voice output, and today PRC's systems can do exactly what was hoped for a decade ago. We now have at our disposal communication tools which can enable children to sound like children, women to sound like women and those even personality selection among several "types" of voices. The technology within which these natural-sounding voices are housed is equally impressive and provides for a simplification and ease of operation through powerful icons used as memory cues for recalling stored parts of speech. The technology has one more feature which sets it apart and ties into the purpose of our meeting. The systems can sing. I have written songs sung by these devices for three years. Initially we would painstakingly program the music into the systems, and when we recorded "My Voice Has Wings", a song I wrote on behalf of non-speaking individuals, it took nine hours of studio time to drop the vocal track into music phrase by

phrase. This year I have performed live several times with singers using current generation technology and on stage; their live performances are clearly art. We have come of age.

Yet the highway is not ours yet, at least not all of ours. We have much work to do. While the Technology Related Assistance Act for Individuals with Disabilities is a great start, funding levels are woefully inadequate and the competitive grant system has allowed many states to go entirely without funding. The Americans With Disabilities Act promises board access, including access to programs concerning the arts, but a long highway stretches before us and we must all maintain our vigilance to the intent of the Act as organizations and institutions of all sizes and types grapple with implementation. We must be there to provide guidance and to articulate the reality that we cannot afford <u>not</u> to be open to access for all.

One of the performances that I mentioned earlier was with Third Street Kids, a performance troupe of children with disabilities in Tucson, Arizona. The critical technology they employ for all of their talented youngsters is the teaching, caring, discipline, and high expectations of the director, executive, volunteers, and parents involved. It is here where the real difference is made. Technology is employed, but without committed manufacturers, specialists, artists, and the community, the "show would not go on." Further, Third Street Kids understand that the arts are a unique and empowering experience for their students, an experience which is not otherwise found in education, family, or community. The arts empower, teach oneself about individual potential, overcome self-doubt, and assist in the building of the rich lexicon of experience which is required to build positive self-esteem.

St. Norbert is to be commended for its commitment to this demanding and essential aspect of the disability movement. The cross section of technology, disability and the arts requires all of us to accept the challenge of the ongoing learning curve of keeping current with technological changes and innovations. It demands that we become active advocates for this specialized area with our administrators and boards. It presses us to learn from each other, to model excellence, and to spread the word. And most of all, it requires that we accept our human responsibility to see in each other our unspoken and unknown potentials, which are actualized through the human expression which is felt and realized through the arts. I would like to close with a song I wrote, for which the line "keys to the highway" was taken. Thanks very much.

## Assistive Technology Boogie

1. Set the price so I can buy it
Give me places where I can really try it.
I want choices like my sisters and brothers.
Let me choose from the other.
Give me time to review it
Let me talk to other folks who have used it.
Build it elegant and clean - a functional machine
Sweet, sweet assistive technology.

Chorus:

Technology, technology
Tell you what it means to me
Technology, technology
It's my key to being free!

2. Give me teachers who can teach it
And when I'm ready to reach, let me reach it.
I want it to work first thing in the morning
And never break down without warning.
Make it durable and flexible and friendly
Make it rugged, tough and sexy, make it trendy.
And if you want to know how it should be
Why don't you just ask me?
Sweet, sweet assistive technology.

Chorus:

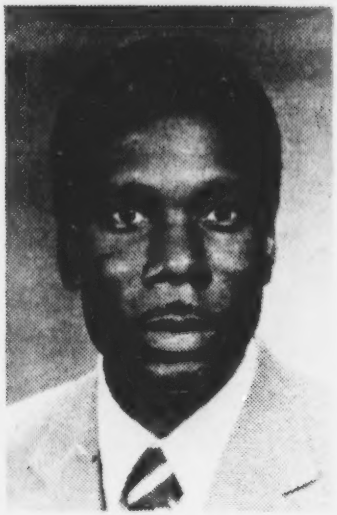
Technology, technology
Tell you what it means to me
Technology, technology
It's my key to being free!

Bridge:

It lets me roll, slip, ripple and glide
Voice the feelings that I'm holding inside.
It's my access to the printed page
And my bridge to the 'lectronic age.
It's the way that I can reach and stand
It's my eyes and ears, my legs and my hands.
It's my key to the highway so wide
It's my ace - it's my ticket to ride!

Repeat Verse 1 and Chorus.

C Jeff Moyer 1990



**Dr. Dale Taylor**

Dr. Dale Taylor is a Professor of Music at the University of Wisconsin-Eau Claire and the Founder and Coordinator of UWEC Music Therapy Program, Clinic, and Psychology of Music Laboratory. He received bachelors, masters, and Ph.D. degrees from the University of Kansas and has been published in such periodicals as The Journal of Music Therapy Perspectives. Speaking engagements have taken Dr. Taylor to Australia, the Netherlands, and the Soviet Union. Dr. Taylor serves on the Board of Directors of the International Association of Music for the Handicapped, the Arts Medicine Association, and formerly held the position as President for the National Association for Music Therapy (Great Lakes region).

# THE SUPPORTIVE RELATIONSHIP BETWEEN TECHNOLOGY AND HUMAN INTELLIGENCE IN THERAPEUTIC ARTS AND SPECIAL EDUCATION

Dale B. Taylor, Ph.D., RMT-BC

Thank you. This is indeed a great pleasure for me to be here today to keynote a portion of this great event, although thinking about it reminded me of the fragile dependence that humans often place on instruments of technology. I am reminded of the time I was given a long and impassioned introduction by a grateful host at a speech I was to give, and just as I stepped to the podium to once again change the world through my earth-shaking oration, a maintenance man came running from the wings of the stage, grabbed the microphone from in front of my lips and announced, "Excuse me folks, but there's a screw loose in our speaker".

When Chuck Peterson asked me to speak, I was greatly honored, but when I began to research the topic in order to illustrate the points that I wanted to make, I looked at the extremely wide range of artifacts that could legitimately be called "technology." It goes from mechanical tools that we all use; to electronically powered non-computerized devices that assist in many human endeavors; to computer programs and computerized technology used for analysis of human functioning, evaluation of impaired functioning, and application as assistive devices for impaired persons; to technically assisted treatment/training programs in the arts; and finally to the growing body of information sources consisting of organizations, support networks, and publications. The magnitude of subheadings possible in this area is overwhelming.

Whenever I hear a preacher giving a sermon, or hear a speaker speaking about the topic of a conference to a large audience at that conference, I get the somewhat helpless feeling that the speaker is "preaching to the people in church"--or talking to those already converted, or at least to an audience that is already sympathetic to his/her cause. I suspect, however, that each of us does not have the same amount of familiarity with assistive technology, and so various individual participants have come to learn, learn more or update, to relearn, or to reconfirm and feel refreshed by the fellowship with others who are engaged in similar kinds of work.

For my part, I would like to have you consider altering somewhat your concept of 'technology' itself -- not a new definition, but a different orientation to, or conceptualization of the term. I would propose that the final, most basic purpose of 'technology' is ... to manage time: to do more things in a shorter amount of

time, or even if not shorter, to better structure and make more efficient use of time: for example, information may be exchanged, stored, and recalled in a shorter amount of time; the physical environment may be better manipulated in order to do more things in given amounts of time.

That is an important concept, but in order to view it in terms of new technology, I would like to investigate our current status through a brief but nostalgic look back at a time when we were first being told that we would someday in the foreseeable future all be at least partially dependent on computers to help manage some aspects of our lives. That was scary -- because the belief was that some people are technological and the rest of us are not. Technology meant that it was technical and you would have to become a technician -- and we thought that either you are or you are not. We had three basic fears:

1. That things would become too "technical" - that even though we took more time or effort to do some things and avoided doing other things that technology might allow us to do, we just did not want to put forth the time and effort to learn all those new things.

However, we have since learned that it is not such a black-and-white situation, that the industry has added some technicolor to the picture by including such things as "user-friendly" technology. For example, the first VCR that I obtained for my music therapy laboratory at the University, an old Sony 3/4" machine, was described to me by our media people as "teacher-proof." That was good news to me because I had been officially diagnosed as "technologically defensive." Things have improved so much and have changed so fast since that time that people wonder when we will be able to have confidence that we have truly purchased the 'latest' or 'most advanced' thing: you may know of Rita Rudner, a famous orator of popular wisdom often seen on our electronic one-way visual communicators, who says that she refuses to buy a Compact Disk player until someone assures her that it is the last thing that they will ever invent. She has taken note of those people who are still trying to get over the rapid obsolescence of the 8-track cartridge player.

2. A second fear was that 'artificial intelligence' would take over and we would experience a loss of control of our environment and our destiny.

Certainly technological devices have not adopted such a mind of their own that we could as yet experience a loss of control of our lives and our environment. Computers no more rule humans than do other examples of technology.

The telephone does not decide who and when to call, a wheelchair does not decide when and where to roll its passenger, and even our increasingly computerized automobiles still do not decide independently where, when, and how fast to go.

3. Related to #2 above was the fear that Technology would replace <u>people</u> in the workplace, that one's own job might be in danger of being taken over by a computer or a robot.

Our fears that machines would somehow become so functional as to take over our jobs seem to have subsided as we realize that computers and other technological advances actually <u>depend</u> on people, and that they <u>expand</u> the capabilities of those of us who use them at home, in our offices, in educational settings, in medical facilities, in industry, and even in the creative and expressive arts. As we look at these various arenas of application, we realize that computers now afford new higher levels of quality time as we participate in activities heretofore inaccessible to persons who experience impairments in various human capabilities. How has technology affected this change? There are three components to the answer.

1. The concept of a "prognosis" has changed from one in which the limits of the effectiveness of treatment are no longer determined by the type of illness or level of impairment, but are determined only by the limits of our - clinicians and educators - knowledge or imagination in coming up with procedures and devices to assist the individual in fulfilling his/her maximum human potential.

2. We are able to help individuals stress <u>normal</u> aspects of their lives and abilities. The concept is one in which technological assistance in an abnormal area of behavior allows use and development of more normal capabilities in another area. The idea is not to apply technology in such a way as to "normalize" the affected domain, but to place ability over disability in expanding capability.

3. In many cases, technology can help directly compensate for problems in individual human potential so as to more closely approach normal physical, emotional, intellectual, or expressive behavior.

In Special Education, I predict that we will use technology to rewrite the concept of Least Restrictive Environment. In fact, some of the devices that we already use are called by the rather presumptuous title of "environmental control devices." I predict that very soon, organizations such as the American Speech-Language-Hearing Association, the Council for Exceptional Children, and other advocacy groups will join forces with appropriate government agencies and legislators to rewrite a certain 16-year-old law that was created just at the dawn of the age of the computerized consumer, and which mandated the LRE as the educational setting of choice for each child.

I also offer a prediction in the form of a caution against any feeling that such changes will take the form of an easy ride on the coat-tails of existing well respected and well recognized legislation. For even as we speak, the forces advocating greater attention to the lives and problems of the elderly are gathering strength and strategy in Washington, D.C. for a hearing that is scheduled to take place very soon before a U.S. Senate Committee on Aging concerned this time with the place of music in the lives of older adults. It appears that the ever growing population of elderly citizens (growing, in part, due to the growth in technologies applied to medicine) is now seen as the group of focus at least in the early nineties. I would suggest here that it may be politically advantageous to form some bridges with organizations supporting legislation and funding for elderly persons because, after all, assistive technology is playing a growing part in their lives also.

Before I leave the topic of cautions, let me offer one more that has caught my attention from time to time in the behavior of some of my overzealous colleagues who have embraced the available technology with all of their being. I would encourage you to avoid becoming too overly enamored with the technology itself. Why do I say this? Let me quote from the December, 1990 issue of the IAMA Newsletter (International Arts-Medicine Association) in which the very first paragraph of the two-page column entitled "President's Message" contains the following sentence, "Increasingly sophisticated technologies continue to force a confrontation with basic ethical issues in medicine and physicians and patients are increasingly dissatisfied in their interactions with each other." One of the potential dangers of overzealous adoption of technology as the answer to all of our problems is the tendency to force the patient or student to use the technology simply because we have it. I try to avoid this very temptation in our own music therapy clinic at UW-Eau Claire. Medical doctors have bordered on major scandal by prescribing use of expensive

procedures to be done on technological devices that they, the prescribing physicians, own. In the therapeutic arts and special education, what should occur is a careful and thorough analysis of the person's needs followed by selection and adaptation of assistive devices as needed by individuals -- as was the case when assistive technology first began to be developed. The technology should always be limited only to that necessary to support the cognitive, physical, and other needs of each individual.

The minimum necessary technology may not always be computerized or even electronic in nature. After all, the use of assistive devices as aids to impaired persons began long before the advent of electronic assistive technology. Consider, for example, the case reported in the New York Times in 1938 describing a girl born without limbs who had become first trombone player in her school orchestra, using an instrument adapted with leather cuffs, rings, hooks, and a zipper.

Let me give you a personal example if I could. A few years ago when I was a senior in college, I experienced a head-on collision in an automobile. It left me in a coma which I stayed in for two days. Subsequently, I received lots of attention from people as I underwent therapy to regain enough strength and coordination to regain the ability to walk. I was able to leave the hospital on my own recognizance and return to school after only one week of hospitalization. What helped me was the decision by the staff to make me no more dependent on assistive devices or other technological procedures than was necessary at any given time, and to remove such assistance as soon as possible in order to maximize cognitive, emotional, and physical independence as treatment progressed.

Another music therapist, an acquaintance from Kansas City, was not quite as fortunate, but spare no tears on her because she now leads a very full life. In 1985, this attractive 27 year-old young woman contracted an extremely rare infection and went from totally normal to complete quadriplegia in a one-hour experience of progressive paralysis while at home alone in her apartment. Of course, with no preparation or training for such an event, her first line of survival was a common example of technology, a telephone. She has described to me how she managed to pull herself near the phone, knock it to the floor, dial it with her nose, and call for immediate help. On a later occasion, her mother wanted to put her into a wheelchair and into a nursing home where she could be cared for, but she was strongly opposed to that. She was able to find resources for physical therapy and found a way to continue even after

her insurance ran out. She has taken advantage of many devices of assistive technology to rebuild her life which now consists of continuing to live on her own by herself, to work as a music therapist, to drive her own highly modified car, to attend regional and national music therapy conferences all over the country, to take scuba diving vacations in Florida, and more activities too numerous to mention. The bottom line is that assistive technology combined with an uncanny amount of personal determination provided the means by which this lady could return to a near-normal set of life experiences despite her drastically altered life style.

Having mentioned insurance in the foregoing anecdote, I am tempted to get into the question of funding because, as we all know, assistive technology can be quite expensive, even prohibitive for some without outside help. I will resist that temptation except to offer another quote from Dr. Richard Lippin, President of IAMA, who states that the U.S. "now has over 37 million Americans uninsured and an estimated 50 million more without enough health insurance to cope with a major illness."

At UWEC: Our Music Therapy Clinic/Psychology of Music Laboratory contains a substantial amount of technology, most of it designed for teaching effectiveness, as research tools, to process information for clinical support, and for direct interactive participation between client and computer during treatment sessions. In addition to remote color video monitoring and recording systems, we have multiple fixed and portable electronic sound recording and playback systems, and three computers, two of which are PC compatibles, and one of which is an Apple IIGS interfaced with a Yamaha YPR9 electronic keyboard with built-in MIDI, which stands for Musical Instrument Digital Interface. We currently have programs such as Personal Musician, Instant Music, and Instant Synthesizer which can be used with a variety of clients to motivate and structure musical expression during music therapy intervention. Using MIDI, we can make <u>any</u> electronic instrument sound like anything by using the computer as a MIDI Controller and adding other units such as synthesizers and drum pads. We currently have in process a proposal for an additional computer. I was greatly encouraged about that when just yesterday, I learned that the University of Wisconsin-Eau Claire has received a large grant to help update technology. What might we be looking to purchase for our clients and students, and why? Before I list some of our current software ideas, I would like to outline some of the advantages of using interactive computer programming in therapy and education.

1. Learning is interactive, not passive, where the person actively communicates with the computer and program to learn a concept.

2. Immediate feedback in response to one's decisions and responses.

3. Personalized dialogue between the user and program in which the person is addressed directly by the machine, rather than as only one member of a large group.

4. The program can be tailored to the individual pace and ability of each client or student.

5. The computer is consummately patient during instruction and reinforcement. (Spitzer, 1989)

Stevens (1991) has reviewed the advantages of Computer Assisted Instruction (CAI) or Computer Aided Learning (CAL) over other instructional methods.

1. Individualized instruction

2. Instantaneous confidential feedback

3. Immediate positive reinforcement

4. Items for drill, practice, or testing are randomly selected

5. Completely accurate and impartial judging of student responses

6. Level of difficulty adjusted to student performance (Equal expectations for all students at each level)

7. Continuous data collection on student performance available

8. Higher levels of motivation usually generated

9. Student anxiety is minimized by de-emphasizing peer competition

A brief comparison of the Spitzer list from Music Therapy Perspectives with the Stevens list from the International Journal of Music Education (IJME) reveals many obvious similarities. Computers provide personalized, patient interaction with immediate feedback. The IJME is the official journal of the International Society for Music Education which has a world conference every two years. These are also the occasions for research seminars by the various ISME commissions, one of which is the Commission

on Music in Special Education, Music Therapy, and Music Medicine. Their publication often contains papers relevant to adaptive/assistive technology in these three related fields.

R. S. Stevens wrote in the 1991 issue of the IJME, "From the music education perspective, possibly the most potentially significant capability of computer technology is that it can transform certain aspects of the creative music process for those students who may lack traditional musical skills (particularly performance skills) from being highly-skill-intensive to being either non-skill-intensive or at least less-skill-intensive. By working in a microcomputer-based 'music composer'-type environment which by-passes the more skill-intensive aspects of music, students may try out their musical ideas, and amend and refine those ideas in response to the instantaneous auditory (and visual) feedback provided by a microcomputer or computer musical instrument." The exciting aspect of this to me is that educators are now recognizing the need to change the age-dependent classroom readiness philosophy in order to adjust classroom instruction to individual learning styles, rates, and readiness levels, instead of assuming that all students in a given class are supposed to learn specific skills and subject matter at teacher-determined times rather than when each child is motivated and in possession of the cognitive skills necessary to benefit from the instruction. It is primarily the advent of computers in the classroom that allows this change to individualization within groups which not only include wide ranges of learning ability, but also even wider ranges of learning, emotional, and physical disability in the mainstreamed classroom. By sharing or using common software between classroom teachers and creative arts therapists in a school, there is much more continuity and transfer of learned behaviors in those cases where a child must be referred to a music therapist, art therapist, or other expressive therapist to gain the needed emotional, social, or physical control necessary to benefit from instruction in the classroom..

Many excellent agencies stand ready to serve as resources for selection and implementation of assistive technology in conjunction with various computer systems. Some of these include the Assistive Device Resource Directory available from the University of Missouri Instructional Materials Laboratory; the Apple Computer Inc. Office of Special Education Program; the Council for Retarded Citizens Disabled Citizens Computer Center; the IBM National Support Center for Persons with Disabilities; the Computer Music Association; and the Trace Research and Development Center on Communication, Control and Computer Access for Disabled Individuals housed at the

Waisman Center on the campus of the University of Wisconsin-Madison.

There are many other very well informed presenters at this conference who will describe and demonstrate the use of specific hardware and software to assist persons with special needs. However, there are some types of materials that facilitate musical participation that I would like to highlight briefly here. A wide variety of keyboards has been developed in different sizes and shapes which can be operated on various computers allowing nearly any person to play music. The range of switches designed in various configurations is broad enough that practically anyone can operate a computer or other electronic assistive device. Communication is also facilitated through numerous indicators such as electronic head pointers and touch window programs that become accessible once an Adaptive Firmware Card is in place.

To facilitate a more musical sound than most computers can produce alone, MIDI interface systems are widely used. The advantage is that MIDI allows an electronic piano keyboard or other familiar instrument to serve as an input device while employing selected software products to perform such musical functions as composing, arranging, printing, and performing. In fact, some software may require a MIDI connection.

Pam Westhoff, author of "Visions" in <u>The Music and Computer Educator</u> says that "In the past it was frustrating to address learning differences, so we taught to a middle ground. This is no longer necessary, and the time has come to rethink our teaching strategy, examine our curriculums and then see where technology fits in . . . . The Computer, serving as an extension of our own intelligence, can help us realize our potential."

In closing, I would emphasize that the wise application of technology in its assistive domain can only serve to help us to be more human.

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Stevens, R. S. (1991). The best of both worlds: An electronic approach to the use of computer technology in music education. International Journal of Music Education, International Society for Music Education, Reading, UK.

Westhoff, P. (1991). Visions: Technology and changing values. The Music & Computer Educator, Vol. 2, No. 4, Hicksville, NY.

## INFORMATION RESOURCES

**Bulletin Boards:**

National Systems Management, Inc.
2021 K Street, NW, Suite 315
Washington, D.C., 20006.
(202)296-1800.

**Assistive Device Resource Directory:**

Instructional Materials Laboratory
908 Woodson Way
University of Missouri
Columbia, MO 65211.
Cat. # SN-38-1.

**Organizations and Agencies:**

Communication Assistive Resource Service
3201 Marshall Road
Kettering, OH 45429
(513)298-0803

Computer Music Association
P.O. Box 1634
San Francisco, CA 94101-1634
(502)584-1239

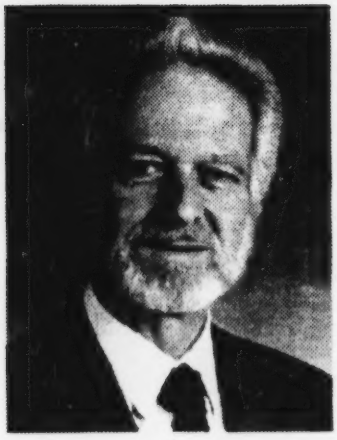
Disabled Citizens Computer Center
Council for Retarded Citizens
1146 South 3rd Street
Louisville, KY 40203
(502)584-1239

Massachusetts Special Technology Access Center
c/o The Exceptional Parent Foundation
605 Commonwealth Avenue
Boston, MA 02215
(617)433-5434

The Council for Exceptional Children
1920 Association Drive
Reston, VA 22091
(703)620-3660

Pennsylvania Special Education Assistive Device Center
Elizabethtown Hospital and Rehabilitation Center
Elizabethtown, PA 17022

Trace Research and Development Center on Communication, Control and Computer Access for Disabled Individuals
Waisman Center
University of Wisconsin-Madison
1500 Highland Avenue
Madison, WI 53705-2280
(608)262-6966



**Dr. Guy Hubbard**

Dr. Guy Hubbard earned his Ph.D. from Stanford University in 1963 after several years teaching elementary and secondary art in England and Canada. Since then he has concentrated his attention on developing and publishing materials for art curriculum and instruction. His interests lay at first with developing structured curriculums for use by elementary teachers. In the early 1970's, he beagan to develop materials that encouraged greater individualization of learning. When microcomuters became generally available, he made translations into forms that made use of the unique machinery. Guy Hubbard has also been deeply involved in promoting graphics in education at all levels and in all subjects.

# A CONSTANT DYNAMIC:
# THE HUMAN-ELECTRONIC FUTURE OF LEARNING

Guy Hubbard

Whatever we may feel about the presence of electronics, one thing is certain: it is playing an increasing part in education at all levels and its influence is certain to increase in the years ahead. With this in mind, the question arises about how arts educators may best apply this technology with their students.

One of the earliest applications of the computer to arts education was treating it as a medium. Having once mastered the rudiments of word processing, for example, students find the task of refining what they have written -- to make it more expressive -- to be comparatively painless. No longer does a revision call for laborious re-writing or re-typing. After a first draft is complete, most of the effort is spent on re-thinking and re-imagining even to the point of printing several versions of a single piece of prose, poetry, or script (for a play). And with the advent of voice input and output, creative re-thinking may become even more accessible and rewarding.

Concurrently, teachers of the visual and musical arts worked with computer graphics and musical composition, where versions of works could be saved at various stages as they progressed toward completion while several alternative solutions might be produced. With only about ten years of experience to look back at, the gains that have been made are substantial. On the other hand, it is even more obvious that arts eduction has barely begun to scratch the surface of the potential of this dynamic new medium. Moreover, the rate of change is such that hardly a day passes without some innovation appearing that opens up new or expanded vistas.

While opportunities for using the computer as a creative medium in education are virtually limitless, equal opportunities are becoming evident in the electronic collection and retrieval of all kinds of information. And with this in mind, I propose to focus my attention on the computer as an information medium for arts education rather than on the computer as a medium for production. I do this because only recently has the power of school level microcomputers become sufficient to handle the large amounts of information necessary for such work. Moreover, since I am not as expert in music or the other arts as I am in visual art, I shall concentrate my attention on work I have been doing in visual art education. I have no expertise in working with students who have severe handicaps. I hope that some of the

things I present here will have potential value for adaptation in that area of education.

For a number of years now, it has been apparent that the advent of microcomputers is making possible greater individualization in all areas of the curriculum and expanding this individualization to all kinds of students. However, instruction first has to be prepared and then entered into a computer and then stored until called on by a student or a teacher, all of which is laborious. In addition, since art is a visual subject, provision must be made for capturing and storing pictures as well as text.

Within the last five years, some of these obstacles have been overcome. As a consequence of increases made in the memory capacity of small computers, and the insights and talents of individuals in the computer industry, programs with names such as HyperCard, HyperStudio, TutorTech, LinkWay, and ToolBook have been published that enable teachers to work as authors and collect text, imagery, and sound and permit students to browse through various combinations of information to follow their own pathways of preference rather than having to follow a predetermined sequence. Given such opportunities, teachers may now write lessons that enable students to follow individual pathways through a course of study rather than follow a single route prescribed by a teacher.

The opportunities that presented themselves as a consequence of these innovative programs--usually referred to as Hypermedia or Multimedia--resulted in explorations of ways in which they might be put to use in visual art education. A number of strong possibilities emerged as a consequence of numerous trials. All depart from the conventional sequencing of instruction where teachers present lessons one after another for all students in a class to follow. Out of these trails, four categories of learning linkage were identified: guided choice, browsing, layering, and information shift. It should be noted that while the organization of instruction in each differs from the others, the same collection of instructional materials may serve as a source for all of them.[1]

[1]At this point, the original presentation included a computer display of each of the following categories of computer-based applications.

GUIDED CHOICE While teacher-controlled lesson selection offers little opportunity for individual preference, the opposite extreme, completely free choice, may be much

less desirable, in that students receive no guidance at all. A compromise lies with what I call Guided Choices, of which there are three kinds.

Strands A strand consists of steps where at the first step a student is asked to select one lesson from a set of no more than four related lessons. The student is free to view each lesson in turn and also see all the images associated with it. When a choice is made, the computer is instructed to print it out, both text and pictures. Armed with all the information needed for the lesson, the student proceeds to execute the tasks stipulated in the lesson. Subsequent steps in a strand are similar in construction. The form of strand may progress, step by step, from simple to complex, from concrete to abstract, or some similar approach typically for four steps at which point a strand reaches completion. A full program might consist of a hundred lessons clustered into twenty or more strands.

One advantage of this method is that students may view numbers of strands and numbers of steps within strands before making choices. At no time, however, are they without either guidance or freedom of choice.

Radial and Web Structures Two other methods of guided choice offer opportunities of instruction--the Radial structure and the Web. The radial organization begins with a focal lesson and then offers the student choices from topics related to the focal lesson. For example, a focal lesson on distorted images might lead to a radial connection to Pre-Columbian art or Expressionist Feelings. An alternative radial organization might center on Japan, where, for example, a general lesson on the art of that country lies at the center with special topics radiating from it in subjects such as Calligraphy or Ceramics.

In contrast, a web structure is more free-form. From a starting point, a student may move in any of several related directions. For example, beginning with a lesson that focuses on artistic ideas from outdoors a web may steer a student to lesson choices where the underlying ideas are derived from photographs, from poetry, or from theatrical lighting.

In sum, Guided Choices provide students with options and yet the structure also maintains control of those choices and the sequencing of the choices so that students do not find themselves frustrated by not knowing what options are open to them. The structure also frees teachers from a constant barrage of questions from students about what they should do next.

**BROWSING** Beyond Guided Choice lies a level best described as browsing, where students have progressively more freedom of choice and where the structure of the learning opportunities is less controlled. From my studies, I have identified four types of browsing structures: free choice from within an established cycle, choices from menus, search by descriptions; and finally serendipity--or entirely free choice.

Choices form a cycle: The first type, free choice in a cycle, is founded on observations of student behavior where, when they receive textbooks for the first time they immediately look through them for all the pictures. This is especially noticeable with art textbooks. Moreover, students frequently want to make art in some way related to preferred works of art illustrated in books. With this in mind, one approach to individual choice in the subject of art is by browsing through works of art. A student brings reproductions to the monitor screen one after another by simply pressing a button. Each screen image, however, offers students choices of instructional opportunities based on that work of art. On demand, details of the work may be viewed, explanations of the work may be read, other pictures by the artist may be seen, the artist's biography may be studied, and information read about the artist's place in history. Conventional studio art lessons may also be chosen, as can lessons that concentrate on the aesthetic dimensions of the work on display. In sum, images are the primary source for student learning.

Menus: Browsing choices can also occur by means of menus of alternative topics. For example, all the lessons in a collection may be grouped in particular categories, such as Figure Drawing or Carving, or perspective drawing without regard for the structure present in the earlier application of Guided Choices. Students may simply browse at will through all the lessons on a given subject and select what they would like to do.

Descriptor search: Another useful search method is by words or descriptors, much like an electronic index where by selecting a topic such as "Color change with distance", or "Dramatic lighting" a student is taken immediately to a corresponding lesson on that subject. Topics tend to be organized most effectively when grouped under headings typically found in general books on art, such as Painting, Romanticism, Diego Rivera, etc.

Serendipity: The ultimate level of browsing is free choice, a form I call "serendipity." Here, a student may freely select from any lesson stored in the memory of the computer. Choices appear randomly distributed in a grid display where each is described briefly in a cell of the

grid. Selection of any cell leads to the immediate display of a lesson - for example, Collage, Classical Influence in America, or Distortion. Since the display is random, no sequence is implied and the student (often through dialogue with an instructor) is responsible for putting together an intelligible sequence.

LAYERING This method is familiar in that students progress from a simple experience to a more complex one on the same topic and from that point to one that is even more complex. With art instruction, two possibilities arise. The first is pictorial: a student is introduced to an entire work of art. The next selection carries her closer to some part of the work for a more detailed study. Subsequent details may direct attention to drapery folds, positions of feet, foreshortening of arms, and so on until all the features of interest have been exhausted.

The layering approach focusing on text is probably more familiar to educators in that students first read about a topic in general. They then progress to reading more detailed information where visuals function as support to the text rather than the central focus. The degrees of details to which the information may go is limited only by the abilities of the students.

INFORMATION SHIFT: The idea of Information Shift falls into three sub-categories: foreign language, complexity, and subject matter. This general area is practical only for use with computers. To consider it in printed form would be impractical.

Foreign language: In America art instruction, like most school subjects, is written in English. When lessons are also available in other languages, opportunities become available that can transform instruction. Students whose first language is not English, for example, may gain a better grasp of what is to be learned if it is written in their native language (and may include alternative images from their culture). An English-speaking student who is studying another language may find such a lesson to be a practical application of language studies in an art class--and in addition learn about the art of that country.

Complexity: Another form of information shift lies in various levels of text being available for every lesson, together with various levels of difficulty in the actual assignments. In this way, students whose verbal or manipulative skills do not correspond to the norm may be able to turn to instruction that fits their needs. Students with reading difficulties may be directed to a version of a lesson that presents substantially the same

task in simpler prose. For students with physical problems, an adaptation of the original will be available that still accomplishes the over-all goals of the lesson.

Subject matter shift: Another exciting possibility lies in the opportunities for moving in and out of different subject areas in non-linear ways that books do not lend themselves to easily. For example, a lesson on Pre-Columbian Art might lead to student learning to making drawings or important pieces or using motifs from that art in their own artistic production. However, the presence of a map of Mexico marked with the sites from which examples shown in the lesson came from can be prepared so as to invite students to extend their understanding of the art. By selecting a site from the map, such as Mexico City (in Aztec times called Tenochtitlan) students may be steered to learn about how the city was established, how Aztec people earned livings, and what they ate and wore. Such extension possibilities rarely occur in typical school conditions, but with the aid of a multimedia program such opportunities are limited only by the designer--who may as easily be a student as a teacher or a professional instructional designer.

Although I have not emphasized student involvement in preparing these kinds of instructional materials, teachers may discover that working with students offers excellent opportunities for developing effective instruction. Through their participation, students may acquire a sense of personal identity that is often missing in more conventional settings. Students may research information, capture images, and prepare diagrams for lessons that are to be entered into the permanent school collection. Moreover, unlike handwritten or typed materials, such programs can be easily copied and exchanged with other teachers for mutual enrichment of education.

In closing, I have to say that I believe that we are on the verge of a major change in the way teachers conduct themselves when working with their students. The traditional linear progress of instruction can now be seen to be only one way of introducing learning. As I stated earlier, however, this process is only just getting started. The greatest invitation of the present day is to participate and begin creating pathways for learning, where multi-media programs become sketchbooks for ideas, and where the best ones are transformed into working instructional programs.

**Dr. Gregg Vanderheiden**

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# Providing Access to the Arts Through Modification of the Human Interface of Computers and Software

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In this paper, we'll be looking at how computers and technology can facilitate art for people with disabilities. Computers are no longer being thought of as something for only computer scientists or engineers; they have come to be thought of as just another tool. We now have computers in our telephones, in our television sets, and on our desk tops. Art is also making widespread use of computers. Computers are being used by playwrights, by poets, by choreographers. Even marching bands now use computers to simulate their routines and tell what they will look like from various angles. The same thing can be done for stage plays, where the computer can simulate the positions of the actors, and the director can examine the staging as seen from various parts of the theater. Stage sets are designed using computers. In fact, some of the arts and graphics used in the stage sets are actually generated by computer-based tools; not only the sophisticated and fancy graphics that look like they're done on a computer, but even old-fashioned sets can now be designed and painted using sophisticated computer tools. Computers are being used to edit films, put in sound effects, and score and revise music.

Many of these uses are things that used to be done by hand, and that individuals with disabilities were therefore often unable to accomplish. Individuals with athetoid cerebral palsy, for example, wouldn't have been able to do the final designs for a stage set, due to their inability to make precise, controlled movements. However, using the computer, we can look at ways of providing such a capability. We have music programs, for example, where the user plays on an electronic piano, and the notes that are played are automatically entered into the computer. The computer can then be used to produce a complete score of the music, including accompaniment, fine variations in timing, etc. An individual with athetoid cerebral palsy may still be unable to play the music on the electronic piano; but we can take that interface and ask whether there is another way that we can get those notes into the computer. Instead of using mice, trackballs, touchpens to do cut-and-paste operations, is there another way that we can point to the screen? If we can find alternate ways of getting the information into the computer, then we would also be able

to use not just the special programs developed specifically for disabilities, but also all of the other standard programs that are out there, developed for the mass market user. Disability-specific and specialty programs can be very useful for getting around the limitations of a particular disability, but the tools developed for the disability-specific programs are never going to be as sophisticated as the ones that are developed for mass market.

What I'd like to address, therefore, is the topic of how we allow individuals with a broad range of disabilities to access and use the standard computer and the standard software.

The first thing to understand is that disability isn't a category, but rather is a continuum. We're not talking disability or limitation across the board. Someone who may be unable to move very well may also be a brilliant musician. What we're asking, therefore, is how we can give people with a limitation in some single dimension the tools to allow them to participate along with everybody else. The tools that we will be examining here are tools that take the standard computer interface and extend it a little further, so that they can be used by more of us. Also, since all of us are aging, and a preponderance of individuals who are elderly have functional limitations of some type, almost all of us, if we are lucky enough to live a long life, are likely to be needing these access features and accommodations ourselves.

**When you can almost use the computer, but...**

**...but you can't use the mouse: MouseKeys**

Many individuals can use the computer keyboard, but are unable to operate a particular program because it requires the use of the mouse. A utility called MouseKeys allows the user to control the mouse cursor by turning the numeric key pad into a MouseKeys control pad. The "1, 2, 3, 4, 6, 7, 8 and 9" numeric keypad keys all move the mouse in their respective directions (i.e., tapping the "1" will move the mouse down and to the left one unit; tapping the "6" will move the mouse one unit to the right). Pressing and holding down any of these keys will cause the mouse pointer to move in that respective direction, slowly at first and then increasing in speed (to a user-settable maximum) until that key is released. The mouse button click and lock are provided by the "5" (for the click) and the "0" (for the lock). (The "." key will then unlock the mouse button.)

MouseKeys can be operated in conjunction with the actual

mouse. For instance, someone who can move the mouse, but not hit the mouse button, could use the "5" or "." keys on the keypad to click and lock the mouse button, but move the mouse itself normally. This also comes in very handy, and not only for people with disabilities, in making fine, precise mouse movements. For example, in the PageMaker manual, the section on advanced use makes specific reference to MouseKeys as a way of providing precise, pixel-by-pixel movement.

**....but you can't press two keys simultaneously: StickyKeys**

Someone who uses a headstick or mouthstick to type, or who can type with only one hand or finger, will again be almost able to use the computer. However, they will have trouble with shifted characters, with commands that require use of the Ctrl or Alt key with another key, or even rebooting IBM computers (which require simultaneous pressing of the Ctrl, Alt, and Delete keys). StickyKeys allows the user to replace multiple simultaneous key selections with sequential key selections, by providing the ability to "latch down" or "stick down" the modifier keys (Shift, Ctrl, and Alt). StickyKeys is turned on by tapping either shift key five times (without disturbing the mouse).

When StickyKeys is on, pressing a modifier key once will latch it down until the next non-modifier key is pressed. For example, if the user presses the "Shift" key, then an "a" key, an "A" would appear on the computer monitor. The shift key would then unlatch. Pressing a modifier key twice in succession will cause it to "lock" and to modify all subsequent non-modifier keys. For example, if the shift key is pressed twice, and the user then presses an "a" key, an "A" would appear on the computer monitor. If the operator continues to press on the "a" key, each press would cause an "A" to appear on the computer monitor. To unlock the shift key, the operator would need to press the shift key a third time.

StickyKeys can be turned off by again pressing either shift key five times. However, it also turns off automatically whenever a modifier key and some other key are pressed simultaneously. It would therefore be invisible to someone else coming up to the computer and starting to use the keyboard; that person would only hear the down-siren of StickyKeys turning off. It can therefore be installed in public access computers to provide access for those who need it, with no interference in the computer's operation for those who do not need it.

**...but you have trouble with unwanted keyboard characters: SlowKeys, BounceKeys and RepeatKeys**

Some people have difficulty using the keyboard because they have erratic or shaky pointing motions. Some get unwanted multiple characters; some may accidentally bump keys as they move around the keyboard; others may accidentally double-press.

RepeatKeys is a feature which allows the repeat rate on the keyboard to be adjusted. Some individuals get unwanted multiple characters because the key repeat rate is faster than their reaction time. RepeatKeys allows them to change the speed of the repeat function and/or to turn it off.

SlowKeys is a feature which facilitates use of the keyboard by individuals who have poor motor control which causes them to accidentally bump keys as they move around between desired keys on the keyboard. The SlowKeys feature allows the user to add a delay to the keyboard so that the key must be held down for a moment or two before it is accepted. In this fashion, the keyboard would only accept keys which were pressed deliberately for a moment, and would ignore keys which were bumped.

BounceKeys is a feature to facilitate keyboard use by individuals with tremor or other conditions which cause them to accidentally double-press a key when attempting to press or release it. BounceKeys does not slow down the operation of the keyboard, but does prevent the keyboard from accepting two very quick presses of the same key. Thus, with BounceKeys on, individuals who "bounce" when either pressing or releasing a key would only get a single character. To type double characters, the user would simply have to pause a moment between typing the key two successive times.

**...but you can't tell when toggle keys are latched: ToggleKeys**

Some keyboards have electronically locking keys, such as the Num Lock, Scroll Lock, and Caps Lock key on an IBM PC or compatible. Small lights are provided on the keyboard to allow people who can see to determine whether these keys are in their locked or unlocked mode. Individuals who are blind, however, are unable to determine the status of these keys. ToggleKeys provides the computer operator with audible tones corresponding to the status of keys which toggle (i.e., CAPS LOCK, NUM LOCK, and SCROLL LOCK).

If ToggleKeys is off, pressing the CAPS LOCK, SCROLL LOCK, or the NUM LOCK key to turn on their respective function will produce a single high beep. If ToggleKeys is on, pressing the CAPS LOCK, SCROLL LOCK or the NUM LOCK key to turn off their respective function, will produce a single low beep. The high and low beeps mimic the activation status of the toggling keys and also mimic the small LEDs (light emitting diodes) located in the upper right hand corner on many newer keyboards. A single high beep means the light is on and the key is toggled on; a single low beep means the light is off and the key has been toggled off.

ToggleKeys will also function with some keyboards which do not have the small lights in the upper right hand corner of the keyboard. The audible low and high beeps can be very useful for all operators when using this style of keyboard.

**...but you can't quite see the screen.**

For individuals with mild to moderate visual impairments, the ability to enlarge the fonts (only) used on the screen may be all that is necessary. Within documents, using larger type is very straightforward, since most programs allow the individual to select the font size. Utilities also exist for using larger fonts in menus. Simply enlarging the font used on the screen, however, only works for individuals needing moderate character enlargement. For individuals with low vision, the image on the screen must often be magnified 4-16 times. Also, the entire image on the screen needs to be enlarged, not just the alphanumeric characters. These utilities or programs create a virtual image which is much bigger than the actual monitor screen. The monitor screen itself then becomes a "viewport" which can be moved about over the virtual screen. The effect would be similar to a normal sighted person trying to use a computer while looking down a cardboard tube such as that found in a roll of paper towels. You can look about on the screen, but you can only see a small portion of the screen at one time. Such screen enlargement utilities usually also have to include mechanisms to allow the "viewport" to automatically follow the movement of mouse and typing cursors. With these magnifying programs, it is possible to enlarge the image on the screen as much as desired -- up to having one character fill the entire screen.

**...but you can't hear the beeps the computer is giving you**

At the present time, people with hearing impairments have little difficulty using computers, because so little of the information being presented is auditory. However, computers are already making wide use of signalling beeps, which may go unheard by someone with a hearing impairment, or someone who is working in a noisy environment. For individuals who cannot hear, onscreen indication of beeps and other sounds can be provided. Currently, the Macintosh has a feature where the menu bar will flash whenever a sound is emitted if the volume control is turned to zero. IBM's new L40 SX laptop computer has a small LCD display which flashes a symbol of a speaker whenever a tone is emitted from the computer, thus providing a visual indication of the auditory sound. The AccessDOS package distributed by IBM also includes a feature called "ShowSounds" which provides a screen flash whenever the speaker on the computer is used. Other third-party products, such as SeeBeep, also exist which provide visual indications on the screen when a sound is emitted from a PC.

In addition, a system-wide "ShowSounds" flag is currently being advocated for all operating systems. By implementing the "ShowSounds" flag at the system level, it could be used by all application programs to determine if the user would like visual indication of any sounds made by the application programs. If an individual was in a noisy environment (such as an airplane or a factory) or had difficulty hearing, that person could set the ShowSounds flag. The operating system and all applications which emitted sounds could then check that flag. If it were turned on, they would accompany all or any auditory sounds with some type of visual indication. Some applications already accompany many (but not all) sounds with some type of visual message. If the ShowSounds flag were set, however, it would be an indication that all sound output should be accompanied by some type of visual indication.

Implementation of the ShowSounds flag would also allow application programs to have closed captioning. That is, newer programs which include speech output or other auditory presentation of information (which is not also already presented on the screen) display a caption window with the text or explanation of the auditory information presented in the caption window (if the ShowSounds flag were set). As packages move toward more multi-media presentations, the ability of application software to provide closed-captioning will increase in importance.
When you can't use the computer at all because...
The modifications and extensions described above allow many people with mild to moderate impairments to use the standard computer and application programs. However, for some individuals with more severe impairments, even these

extensions are not enough to make the computer accessible.

**...you can't use the keyboard or mouse even with adaptations.**

While modification to the standard keyboard allows input by some individuals, alternate "special" keyboards or input devices are needed by others. These alternate keyboards take many different forms, including expanded keyboards, miniature keyboards, headpointing keyboards, eyegaze-operated keyboards, Morse code input, scanning keyboards which require operation of only a single switch (operated by hand, head, or eyeblink), and voice operated keyboards. Some of these keyboards connect to the computer in place of or along with the standard computer keyboard. Other alternate keyboards connect to the serial or parallel port on the computer, and use special software to cause their input to be injected into the operating system and treated as keystrokes from the standard keyboard. In still other cases, the "keyboard" may appear onscreen in a special window. The individual then selects keys on that video keyboard using a headpointer, single switch scanning algorithm, or other technique. The keys selected on the video keyboards are then fed through the operating system so that they appear to application programs as if they had come from the standard keyboard.

**...you can't see the screen at all.**

For individuals who cannot read the image on the screen even when enlarged, some mechanism for presenting the information in nonvisual form is necessary.

Access programs which currently exist on the Macintosh and are being developed for OS/2 and Microsoft Windows are capable of providing full access to the basic operating system constructs (windows, menu bars, dialogue boxes, etc.) as well as text within application program documents (as long as the text drawing tools of the operating system are used to create the text image). In order to access information which is drawing or picture-based (line drawings, charts and diagrams, floor plans, etc.), several advanced strategies are being explored. One approach involves the use of a virtual tactile tablet with a tactile puck/mouse. A vibrating array of 100 pins is mounted on a special puck/mouse. As the mouse is moved about on the tablet, the tactile representation of the information on the screen is provided to the individual's fingertip. In this fashion, the individual can actually feel the information on the screen. Coupled with screen reading features, this system allows the

individual to feel the image on the screen and to have any words on the screen read aloud as they touch them.

Other experimental techniques being examined are routines which would automatically recognize and describe verbally stereotypic information presentations, formats, (bar charts, pie charts, etc.) and routines which would provide special image enhancement (edge detection/enhancement, etc.) to make complex graphics simpler to tactually explore.

**Summary**

We're not thinking of computerized art. Rather, we need to be looking at art, period, and then looking at the process -- the drawing, the writing, the manipulation -- of how an idea can get from our brains into tangible form. As we examine that process, we begin to separate the "do what" that is our actual objective from the "how to." By divorcing the "how to" from the "do what," we can look at ways that computers can provide new interfaces to the traditional tools of the arts, and allow people with disabilities to accomplish the "do what."

**Resources**

**For further information on adaptive devices for computer access...**

*Trace ResourceBook: Assistive technologies for communication, control, and computer access. 1991-92 Edition.* Berliss, J.R., Borden, P.A., and Vanderheiden, G.C. (1991). Available from: Trace R&D Center, S-151 Waisman Center, 1500 Highland Avenue, Madison WI 53705. Price (September 1991): $50.00.

*Hyper-ABLEDATA.* A desktop version of the ABLEDATA database, a comprehensive database of over 16,000 rehabilitation and assistive device products. The full range of technology is included, from wheelchairs to sensory aids to communication devices. Available on CD-ROM disk. Available from: Trace R&D Center, S-151 Waisman Center, 1500 Highland Avenue, Madison WI 53705. Price (September 1991): $50.00.

**Access software available from standard computer manufacturers**

(See the *ResourceBook* for information on devices available from third-party manufacturers.)

*Access Utility Software Package for Windows* 3.0. The

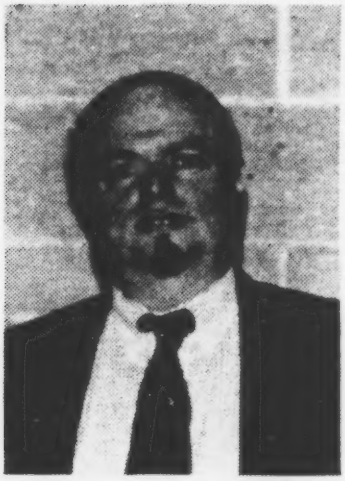
Trace R&D Center has developed an Access Utility Software Package to provide access to Microsoft Windows 3.0 for people with disabilities. The package is included as part of the Windows 3.0 Supplemental Driver Library. The Library can be obtained either by downloading from Microsoft OnLine, CompuServe, or GEnie, or by calling 800/426-9400 and ordering from Microsoft directly.

*AccessDOS* is a software program developed by the Trace R&D Center with support from IBM. It provides extended keyboard, mouse, and sound access for IBM DOS users. AccessDOS (Part Number 84F9872) is offered "as is" without charge. To order, call IBM at 800-IBM-PCTB (800/426-7282), or contact an IBM Authorized Dealer, Marketing Representative, or Branch Office.

*CloseView* is a screen enlargement program included free with every Macintosh shipped, as a part of the system files.

*Easy Access* provides extended keyboard and mouse access for the Macintosh. It is included free with every Macintosh shipped, as a part of the system files.

NOTE: *Systems 3* is a research prototype of a system to provide full access to graphics-based computers for persons who are blind. An initial prototype of Systems 3 has been developed in conjunction with Berkeley Systems, Inc., and with the cooperation of Telesensory Corporation, Kurta, Inc., Apple Computer and Articulate Systems, Inc.



**Mr. Bruce Baker**

Bruce Baker has taught widely in the United States and Europe. He serves as a consulting linguist to the Prentke Romich Company in Wooster, Ohio, as well as being a contributing editor to Communication Outlook, a publication of the International Society for Augmentative and Alternative Communication. He is the developer of the semantic compaction technique for language representation and the author of both the MinSpeak software approach and Words Strategy. He has been cited for his significant contributions by the American Speech-Language and Hearing Association.

# Art, Language, and Disability

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Art, language, and disability. The relationship among these notions may not, at first, be obvious. The relationship between art and disability, while not obvious to the world, is certainly obvious to those aware of the magnificent summer programs at St. Norbert College. The theme of this essay is that art can bring access to language in a very special and unexpected manner. The theme at the summer programs at St. Norbert has traditionally been that of providing access to art for people with disabilities. The theme of this paper will be how art can provide access to language for people with severe communication impairments.

More than one million people in the United States alone cannot successfully use speech or hand signs owing to cognitive impairments or paralysis. The etiologies of the conditions causing severe communication impairments are varied. Among them we find cerebral palsy, traumatic brain injury, mental retardation, stroke, Parkinsonism, and multiple sclerosis. A technical term to describe the inability to articulate owing to paralysis is neurogenic dysarthria. People unable to articulate words owing to neurogenic dysarthria often are unable to write, type, or use hand signs owing to the same paralytic impairment which has caused the dysarthria, e.g., cerebral palsy, etc. Individuals who cannot speak owing to cognitive impairments include those with mental retardation or those who have experienced strokes. Those who experience congenital mental retardation may have a broad range of incapacities, including the understanding and use of words (language processing), and those who have experienced strokes may have lost little cognitive ability, except in those areas dealing with language processing.

Many of us, I am sure, have seen individuals, who have experienced laryngectomies, holding sound generators against their throats. This technique does not work for people with neurogenic dysarthria (paralysis of the vocal tract) or cognitive impairments precluding speech. The throat-sound generation devices require not only an intact articulation tract with upper throat, tongue, and lips being fully mobile and under the speaker's control, but they also require intact cognitive processing of language.

Individuals with neurogenic dysarthria or cognitive

processing deficits involving speech and language, nevertheless, need to be able to communicate. If someone cannot speak or use standard hand signs for a variety of reasons, he or she still needs to be able to communicate. Further, he or she needs to be able to communicate by voice as well as through gesture and facial expression. Speech-language pathologists have learned to teach individuals to optimize their gestural pragmatics. Speech-language pathologists have also learned to teach individuals how to maintain appropriate eye contact. What I am going to talk about today is how art is opening up technology which provides individuals with access to voice -- in particular -- electronic speech synthesis.

Speech synthesis equipment now makes it possible for many individuals who cannot use speech or use hand signs to supplement their gestures and facial expressions with human sounding voice generated in small, portable computers. More than 15,000 individuals across the English-speaking world and parts of Europe are now successfully operating such equipment.

In order to generate speech from a computer, several elements have to be present. First, the computer must have a program in it which allows for the generation of speech sounds. There are many such programs available.. Perhaps the most famous of these programs is DECtalk™ provided by Digital Equipment Corporation. The synthesizer, in turn, needs to be connected to a speaker. The synthesizer is composed of many integrated programs which contain language information. The synthesizer will have a program for generating a basic and central speech sound called a "formant." These formants in the synthesizer are purely electronic in origin and are in no way recordings of human speech. The formants in turn will be acted on by a program containing a vocal tract model. The elements of the vocal tract model will act on the formants as filters to alter the formant's sounds much the way our throats and mouths alter the tones arising from our laryngeal folds. The programs containing formant and the vocal tract model in themselves can produce human sounds. These programs, however, must be commanded in certain very precise ways to produce those human sounds of a given language in the manner and style and sequence of the given language.

A text-to-speech algorithm, as well, must be integrated into the synthesizer. The text-to-speech algorithm will tell the synthesizer what sound to produce for the letter "t". It will also tell the speech synthesizer that when the letter "t" is both preceded and followed by a vowel, that the letter "t" will be pronounced like a "d" as in the world "Minnesota." It will also tell the synthesizer

that the letter "a" in an unstressed syllable will be pronounced much like the letter "u" in "up" as in "America."
The synthesizer will also need to have a model of syllable structure. It will need to know the second from the last syllable usually receives stress in English. For example, the word "contribute" is stressed on the second from last syllable. When another syllable is added in the form "contribution," the stress shifts from the syllable "tri" to "bu." Thus, a speech synthesizer needs to have much information about language structure as well as information about the sounds of human speech.

As smart as a synthesizer may be, however, it still needs to be told what to say. It is at this juncture that people who have paralysis experience a very special issue. If one is to type letters into a synthesizer to command it to say words, one is going to need to type many letters. If an individual's physical access to a computer is slow or labored in any way, the process of entering text into the computer can be very difficult. A typical sentence can have as many as 50 letters. 50 key actuations or 50 switch closures can be very time consuming, not to mention tiring. Thus individuals with physical impairments precluding speech and the use of hand signs have great difficulty in the use of speech synthesizers. Individuals who experience cognitive impairments precluding speech have difficulties with letters as well. Learning to read and spell is often beyond the cognitive capabilities of individuals experiencing mental retardation. Thus the very cognitive impairments which preclude speech also preclude the mastery of the alphabet and traditional orthography.

No matter what the cause of severe communication impairment, the language representation needs of individuals with these impairments run in similar veins. Traditional orthography, that is the alphabet, does not seem to work well or at all. Alternatives to the alphabet have been developed. These systems feature large collections of single-meaning graphics. One can develop a symbol which means "book" or a picture which means book. The problem with single-meaning graphics is that a very large collection of these graphics is needed if one is going to represent a core 5,000 to 7,000 word vocabulary used by the average six year old child. Another technique has been proposed in recent years which addresses the problems experienced through letter systems or single-meaning picture approaches. This technique is called semantic compaction. It is a picture approach but with a major shift in emphasis. This picture approach abandons the notion that a picture represents only a single idea. This approach finds in pictures multiple meanings. An "apple" is also a fruit. It is also

something one eats. It is red. It is round. It comes from trees. It is alive. It can fall to the ground. It can even be a computer! The objects of everyday life have many meanings and associations, and these meanings and associations can be used for linguistic purposes in a concept-oriented language retrieval technique. The semantic compaction technique is embodied in commercial products whose brand name is Minspeak™. The illustrations of pictures in a Minspeak™ system must be colorful, explicit, illustrate many details, and at the same time not overwhelm the eye. During the past decade, I have participated with artists in the development of many sets of pictures designed to represent language. The process is exhilarating and at times even fun.

In the past five years, there have been annual conferences, one in the United States and one in Europe, where speech pathologists, linguists, and artists gather together to pool their knowledge and apply the products of art in this highly specialized use. Many thousands of individuals are using this art to communicate. A substantial body of literature has been developed to explain how pictures in sequence can be used to represent language. For those interested in further information, I would refer you to two articles in Byte magazine, September, 1982 and March, 1986 where this topic is discussed at some length. These publications are universally available at libraries both small and large. Those interested in more information should contact Semantic Compaction Systems at its Pittsburgh, Pennsylvania address. It appears to me as a student of the Humanities that it is in the medium of artistic expression that we find the most efficient language representation system available. It also appears to me that this language representation system, because it is pictorial, can be used by individuals with cognitive impairments as well, where it transcends the cognitive impairment and reaches into shared human experience.

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**Chuck Frame**

_huck Frame is an assistive technology specialist and speech/language pathologist with 16 years experience in the Green Bay Area Public Schools, WI. He has developed the Finger Spelling Font for the Macintosh computer and co-developed a visible speech aid for the deaf called Spectro-Speech. A recent accomplishment is the Voice-in-the-Box, a low cost digitized speech augmentative communication aid. He has worked for two years as principal investigator for the NEA/IBM funded Arts Access through Assistive Technology Research Project at St. Norbert College.

# CREATIVITY UNLEASHED: ACCESS TO ART AND MUSIC SOFTWARE THROUGH YOUR TOUCHTALKER/LIGHTTALKER

Chuck Frame, M.S.CCC-SLP
Assistive Technology Specialist
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Professionals who work in the field of Augmentative and Alternative Communication are aware that MinSpeak and TouchTalkers/LightTalkers are opening up new horizons in communication for non-speaking persons. Most are also aware that these devices can be interfaced through keyboard emulating interfaces to computers to do word-processing. But few may realize that TouchTalkers/LightTalkers can also be interfaced, through the Adaptive Firmware Card and Trace-Transparent Access Module, to the Apple IIGS, Macintosh, and IBM with full mouse-emulation capabilities to control a host of paint/draw, CAD, animation, music composition, game, and hypermedia software. Now, through the power of MinSpeak and TouchTalkers/LightTalkers, new horizons in artistic and musical expression are opening up to non-speaking persons as well.

The research described in this paper grew out of experimental work in access to the arts by the Assistive Technology Project in the Green Bay, Wisconsin public schools. We were disturbed that physically handicapped and non-speaking students are often excluded from traditional art and music classes. If they do attend, they are usually passive observers.

The impetus for the project came from an incident three years ago involving a twelve-year-old TouchTalker user named Jed. One day, Jed was watching the writer play with PaintWorks Plus, a paint/draw program, on the Apple IIGS computer. He asked me through his TouchTalker if there was any way that he could try the program. I told him "no," I was sorry, but to use the program he had to use the mouse and that required very precise hand-eye coordination--something that a young man with severe dysarthria would not have.

Shortly after that, I became aware that the Adaptive Firmware Card had very extensive mouse emulation capabilities that could be accessed through the Unicorn Expanded Keyboard. I taught myself AFC mouse macro programming, and soon came up with a mouse emulation overlay for PaintWorks Plus that included direct selection of all the drawing tools and colors on the color palette. Simply selecting a square on the Unicorn Board that represented a color or tool caused the mouse cursor to jump to that object on the screen and select it. Pressing squares with up, down, left, and right

arrows caused the mouse cursor on the screen to move in the corresponding direction. Jed was allowed to try the interface, and the squeals of delight we heard as he drew circles and squares and colored them in with different colors let us know that we were on to something good!

Some experimental interfaces were piloted in the summer of 1989 in the Young Artist Workshops, a three-week experience in the visual and performing arts for about 120 handicapped students conducted annually at St. Norbert College in DePere, Wisconsin. The association with Young Artist Workshops grew and resulted in two consecutive grants from the National Endowment for the Arts, with support from IBM and a very generous equipment loan from Prentke-Romich Co. to develop further adaptive art and music interfaces.

The project culminated in the summer of 1991 with a national Assistive Technology and the Arts Conference at St. Norbert College, the publication of a resource package entitled "Key to the Arts," and a professionally produced video on assistive technology entitled "If You Can Move Your Head, You Can Move Your World." The "Key to the Arts" package includes a manual "Access to the Arts Through Assistive Technology," twelve colorful overlays for the Unicorn Expanded Keyboard, and an Adaptive Firmware Card setup disk for twelve popular paint/draw, creative writing, and music composition programs. In addition it includes five overlays and interfaces for the TouchTalker and LightTalker. Three programs for the TT/LT are supported for the Adaptive Firmware Card on the Apple IIGS. They are Electric Crayon, KidWriter Gold, and Music Studio's "PaintBox." In addition, two programs are supported for the T-TAM: MyPaint on the Apple IIGS, and Electric Crayon on the IBM.

The rest of this paper will address the particulars of programming TouchTalker/LightTalker mouse emulation interfaces through the Adaptive Firmware Card and T-TAM for the Apple IIGS, Macintosh, and IBM.

## Adaptive Firmware Card

The Adaptive Firmware Card-Model G32 is a keyboard and mouse emulating interface for the Apple IIGS computer. An updated version, the AFC-G32e works on either the Apple IIGS or the Apple IIe. Among the AFC's seven different alternative input modes is the ASCII method. These letters stand for "American Standards Code for Information Interchange." Virtually all computers, including the TouchTalker/LightTalker are capable of

sending ASCII characters out through a serial or parallel port for information interchange.

To use the TouchTalker/LightTalker as an alternative input device with the Adaptive Firmware Card, three things are needed: a special ASCII setup which is loaded off the Menu and Construction Disk; an interface cable with a DB-25 connector on one end and a 36-pin Centronics connector on the other, and a custom overlay.

The ASCII setup receives ASCII code from the TouchTalker/LightTalker. This is represented by the letters A-Z, the numbers 0-9, and various special characters and punctuation symbols. A letter, number, or special character can be defined in the setup as a mouse macro or navigational arrow, corresponding to a particular location on the communication device.

The ASCII characters, which can be programmed into a one- or two-symbol theme in the communication overlay, are sent out of Serial Port B on the device. They are transmitted via a special cable to the AFC's junction box.

In order to set up the correct communication protocol, you must first enter the communication aid's 128-location fixed base. Using the fixed overlay as a guide, set the Serial Select (location I-4) to "Serial Port B." Set the Baud Rate (location I-5) to 300. Then select "Serial On" (location J-6). Then go back to custom base by selecting M-7 and M-6.

Load the ASCII setup from the Menu and Construction Disk that corresponds to the program you wish to run. Then load the application program. There are three ways to enter mouse emulation mode. You may select location P-1 which is programmed to turn mouse emulation on. Alternatively, you may turn the LT/TTon, and then off. Turning the device off causes the setup to enter mouse emulation mode. Hit Return on the computer keyboard and then turn the device back on. Or, hit the keys "/=" on the computer keyboard. You will hear a beep and see the message "Now entering mouse emulation mode." Hit return. You may now use the overlay with your application program.

## Trace Transparent Access Module

The Trace Transparent Access Module (T-TAM) is a small box which is connected between the keyboard (and mouse if available) and the computer. The T-TAM allows many individuals to access and use the computer even if they cannot use a standard keyboard and mouse.

The T-TAM actually performs several functions to allow both disabled and able-bodied users to access the computer. The T-TAM modifies the behavior of the standard keyboard so that it can be used by people with mild or moderate disabilities. The T-TAM also allows the user to change the function of the shift key and other modifier keys so that rather than having to hold two or more keys down at the same time, the user can type one key and then the next key, etc. This feature enables someone who types with one finger, a mouthstick, or a headstick to type required multiple key combinations. The T-TAM can slow down the response of the keyboard so that inadvertently pressed keys will not be sent to the computer while also allowing the user to adjust or turn off the key repeat rate. The T-TAM will emit tones when the Caps Lock, Num Lock, and Scroll Lock keys are pressed so users who cannot see the lights on the keyboard can tell whether these keys/functions are on or off.

For those individuals who cannot use the mouse, the T-TAM provides a MouseKey feature which enables a user to control the mouse movement and mouse button clicks from the keys on the numeric keypad. For individuals who cannot use the standard keyboard or mouse (even with modifications), the T-TAM has a "General Input Device Emulating Interface" which allows people to use an augmentative communication aid or other special aids in place of the computer keyboard and mouse.

The T-TAM works with all Apple computers which use the Apple Desktop Bus (ADB) for mouse and keyboard connections. This includes the Apple IIGS and all of the Macintosh computers except the Mac Plus, 512 and 128. It will not work with an Apple IIe unless you have upgraded it to a IIGS. The T-TAM works with all the IBM PS/2 series of computers including those with MicroChannel. The T-TAM will work with IBM AT computers. However, the AT's do not have a standard mouse or a mouse port and will be unable to emulate the mouse functions of the T-TAM. The T-TAM does not work with the original IBM PC or XT computers. (from draft of T-TAM manual rev. 4.0 of August 1990, Trace Research and Development Center, Madison, Wisconsin)

The following are details on setting up the TouchTalker/LightTalker to operate with the T-TAM using mouse emulation. A serial communications cable with male DB-25 connector on one end connects into Serial Port B of the TT/LT and the female DB-25 connector on the other end plugs into the T-TAM. From 128-location Fixed Base, set the Series Select to "Serial Port B," set Baud Rate to "300" and select "Serial On."

There is no setup disk to load as with the Adaptive Firmware Card. All commands are programmed under keys on the TT/LT and are sent out the serial port to the T-TAM which interprets them to control the keyboard and mouse. By programming a two-symbol theme or level which is used only to control the computer through the T-TAM, you will have instant access to this feature at any time.

The specifics of programming mouse emulation for controlling paint/draw and music programs are the following. All mouse emulation commands begin with an escape character. On the TT/LT an escape character is programmed by first selecting "CTRL" on the fixed overlay (location I-8), then selecting the left bracket ([) symbol (location D-4). After making these selections, you will see nothing on the LCD readout, but you will notice that the cursor has moved one space to the right.

To begin mouse emulation, it is necessary to enter the **moureset** command, which will cause the mouse to release any locked buttons, move its position to the upper left hand corner of the screen, and reset its internal x-y position counter to (0,0). Its format is <esc> **moureset.**

The **moulock** command allows the user to press down and hold a specified mouse button. Its format is <esc>, **moulock.**

The **mourel** command releases the specified mouse buttons after they have been locked. Its format is <esc>, **mourel.**

The **click** command will cause the specified button to be locked down and then immediately released. This action is known as a click. Its format is <esc>, **click.**

The **dblclick** command will cause the specified button to be double clicked. That is, the button is locked down and then immediately released, locked down once again, and immediately released. Its format is <esc>, **dblclick.**

The **goto** command will cause the mouse to move to the specified absolute position. The position is specified as x and y coordinates and represent single pixels on the computer screen. Both x and y values are greater than or equal to 0. The origin of the axis is the upper left hand corner of the screen. The x values on the axis increases to the right, and the y value increases as you move down. Its format is <esc> , **goto,+/-x coordinate, +/-y coordinate.**

The **move** command will cause the mouse to move the specified number of units in the x and y directions. Positive values will move the mouse to the right or down,

negative values to the left or up. Its format is <esc>, **move, units in x direction, units in y directions.**

Examples of all these commands may be found on pp. 28-31 in the manual "Access to the Arts Through Assistive Technology" for the Electric Crayon setup for the IBM. You can get a feel for how mouse emulation works on the T-TAM by programming each of the commands listed into the specified locations in a two-symbol theme of your TT/LT and trying it out. Please note that this setup was created for the Electric Crayon running on an IBM with VGA graphics. It may not work correctly on an IBM or compatible using EGA or CGA graphics. It definitely will not work on an Apple IIGS as is because the IIGS's screen coordinates are entirely different from the IBM. However, it could be easily modified to work on the Apple IIGS by simply defining the screen coordinates for the menu bar functions and the paint palettes and substituting them for the IBM screen coordinates.

## T-TAM, or Adaptive Firmware Card?

Advantages of the T-TAM over the Adaptive Firmware Card are that you never have to load a setup from a disk. Setups are located in two-symbol themes "tucked away" in your TT/LT and can be accessed at any time. The T-TAM mouse emulation commands are simple to learn and use.

Disadvantages are the following: It is extremely difficult to plot screen x-y coordinates while programming the T-TAM. It is at best a trial-and-error process. With the Adaptive Firmware Card, on the other hand, setting a mouse tab is as simple as moving the cursor to the desired location on the screen, hitting the Tab key twice, and giving the mouse tab a letter name. The screen coordinates are entered into the mouse tab command automatically. The mouse tab can then be incorporated into a mouse macro. Also the Adaptive Firmware Card mouse macro programming language has Fix and Go commands that can be entered into a mouse macro. Fix "remembers" the screen coordinates at which the mouse macro started executing and Go returns the cursor to that location when the macro is finished. There are many occasions when this feature can save a great deal of effort for the handicapped user. This feature is not possible to implement on the T-TAM.

What the T-TAM delivers that the AFC does not is the ability to use communication aid systems to do keyboard entry and mouse emulation on both the Macintosh and IBM's and compatibles.

## Future Directions

Through the past two years, most of the problems with programming mouse emulation interfaces for the TouchTalker/LightTalker have been worked out. We can now concentrate on broadening the base of our work. In the past, most of our work centered on the Apple IIGS. We look forward to developing a large "library" of TouchTalker/LightTalker interfaces and overlays for creativity programs on the Macintosh and IBM. In addition, any T-TAM setups for the IBM will work equally as well with the Trace Access Utility for Windows 3.0 and AccessDOS, which are software T-TAM emulators.

Hopefully, a distribution vehicle can be found to offer these setups and overlays to TouchTalker/LightTalker users at a very reasonable cost.

Our sincere hope is that the day will soon come when TouchTalker/LightTalker users will have "equal access" to the same range of software programs on Apples, Macintoshes, and IBM's as their able-bodied peers.

For further information about the "Key to the Arts" package, the "Access to the Arts Through Assistive Technology" manual, and the video "If You Can Move Your Head, You Can Move Your World," please contact:

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**Colleen Daley Sanders**

Colleen Daley Sanders is Director of Youth and Teacher Education at Film in the Cities, a non-profit media arts center located in St. Paul, MN. The organization has provided quality media arts education programs to youth and adults since its inception in 1970.

Ms. Daley Sanders holds a Masters degree in photography from the University of Minnesota with a minor degree in education. She has extensive experience teaching children and adults. For the past five years, Ms. Daley Sanders has developed curricula and programs that provide opportunities for educators to link media arts to classroom instruction. She serves as an Advisory Council member for the Minnesota Alliance for Arts Education and has recently presented lectures on integrating media arts across the curriculum at the Universidad Nacional de Educacion a Distancia in Madrid, Spain.

# BREAKING BARRIERS
# INTEGRATING MEDIA ARTS ACROSS THE CURRICULUM

Colleen Daley Sanders

Film in the Cities' Arts & Handicapped program developed as a response to teachers' and administrators' needs for media arts curricula for physically handicapped and learning disabled students through the use of video, computer graphics, and audio production. Now in its fifth year, the goals of the project are to familiarize handicapped students and their teachers with new technologies not requiring physical dexterity, enabling them to create original art; to train artists to work with handicapped youth; and to develop and test curriculum and teaching approaches to allow the project to be duplicated in other schools.

New technologies (video, computer graphics, and audio) are frequently used to instruct students and assist them to build academic skills (for example, reading or math). Media are much more rarely approached as art forms or used for individual artistic expression, included in arts curriculum, or regarded as basic to education. Yet, in our culture, non-print media are the most prevalent sources for information and entertainment.

Because of their motor impairments and the demands of mainstreaming in academic courses, handicapped students have fewer opportunities than their able-bodied peers for arts education. This multi-year demonstration project explores and documents ways in which new technologies can bring arts education to handicapped children. The media artists who are trained to work with handicapped children become a resource for other schools. Through in-service sessions, site teachers develop the skills necessary to integrate media as an art form into their on-going curriculum areas in subsequent years.

From March - May, 1990, the project at South High School, Minneapolis, incorporated video and audio production with ten physically handicapped students, including one blind student with an interest in writing and music composition. Students earned two English credits for participating and for completing individual and group projects during the trimester course. Topics included a documentary on homelessness, a personal narrative about Native American drum ceremonies, a documentary concerning people with disabilities, an experimental piece about after-school activities, and a powerful audio tape on rape produced by the blind student.

In 1991, the project was implemented at Anwatin Junior High School, Minneapolis, for six weeks. The class met

four days each week, for two-hour sessions each meeting. The theme for the project was "A Festival of Nations," to coordinate with Anwatin's Festival of Nations fair, a day-long cultural event attended by the school and community. Student presentations at the fair range from the preparation of international foods to the display of costumes, crafts, and icons of different cultures.

The students oversaw their own projects: they researched their chosen nations and cultures, created storyboards, developed scripts, scouted talent, and produced and edited the video tapes. As students began to work, their photographs and storyboard drawings were posted around the room. This served to personalize the room as well as to reinforce the concepts that the students had mastered.

The cultures they selected were as varied as the students themselves:

> A pair of students decided to interview their peers at Anwatin to produce a tape about "teen culture".
>
> A Colombian student, adopted by an American family, combined footage from his native country with interviews to create his tape. He stated that he wanted to show that there was more to his country than the drug culture which regularly makes the evening news.
>
> African-American history was selected by another pair of students. They interviewed teachers and students at the school to learn more about slavery, the underground railroad, and other events and issues specifically affecting black Americans.
>
> Popular American culture was selected as the topic by another pair, who blended television advertisements and other footage to produce their interpretation of our contemporary culture.
>
> A tape entitled "Indian Culture" was a personal exploration of one student's background: having left his natural home for a foster family, he is searching out Indian traditions and myths to learn more about his heritage. He interviewed a number of individuals, including an Indian student who participated in last year's Arts & Handicapped project, and who produced a tape on a similar topic.

A ten-day computer animation experience working with learning disabled elementary students was conducted at Stonebridge Elementary, Stillwater. The project encourages personal expression, enhances problem-solving skills, and increases students' self-esteem through the

active completion of all phases of production. Using the theme "What's It Like To Be A Kid?" students learn the complicated steps necessary to animate their characters, and then create the script, the storyboard, the art work, and the rap music-based audio track. During the course of the project students learn how to analyze mass media, develop skill at working a computer, learn new vocabulary words, and develop a sense of pride in their accomplishments. The project is divided into three phases which I will outline:

**What's It Like To Be A Kid?"**

I. The Power of Media - Days 1-3

Prior to beginning production activities, the students study the mass media through facilitated discussion and simple activities designed to encourage their critical thinking abilities. Students first develop a definition for mass media and its purposes: to inform us, to entertain us, and to sell us products. They then complete worksheets which assist them in identifying types of media and the message being communicated. (see attached 2 worksheets - Information?/Entertainment? and Find the Media in Your House)

Next, students examine the newspaper and the relationship between photo and text. The worksheets (see attached two worksheets - Fit the Photo! and Lay Out the Photo) provide students with situations similar to those facing a news editor - they must select an image that illustrates the text, determine a title, and create the text.

These activities provide a framework for students to begin to look critically at the world around them, to learn about the

in creating media works.

II. Pre-production Activities - Days 4-5

Once students have a strong background in media literacy, they are ready to begin production activities. The media artist meets with the students to determine the theme and introduces the equipment they will use. Short hands-on experiences are developed to familiarize the students with the equipment. The students then begin planning, developing the script, the storyboard and the artwork to illustrate their story.

III. Production and Evaluation - Days 6-10

Students develop their characters and begin the computer animation process. Production continues for the next five days. Students also complete the audio track - in this case a rap-music-based sound track. Students also audio tape the stories which accompany their animation segment.

Once all production is complete, the students screen their work to their classmates, their parents, and their community. The finished piece will also air on a local cable access channel. Students complete an evaluation which provides Film in the Cities with suggestions for future projects. The overall project approach and quality are evaluated by the Director through discussion with the artist, selected teachers, and others.

An outside evaluator assisted the Project Director with evaluation of the implementation process, including teaching approaches and learning styles. A primary objective is to modify and test materials and approaches developed in previous years to assure that the project can be duplicated in other schools and used with more severely handicapped youth. The evaluator noted that the project clearly met its goals. She also stated:

> "The students went from spectators of video production to capable camera operators, skillful editors, and visionary producers. In addition, they developed organizational skills which included planning, time management, research/information gathering, decisionmaking, and the ability to work as a team to achieve common goals. Perhaps the most valuable lesson the students learned was that their ideas have merit and can be communicated to others, in spite of physical limitations. This realization...was an obvious point of pride, when the projects were viewed by the family and friends of the students."

Results of Film in the Cities' Arts & Handicapped project have been significant and positive. The use of electronic technology has allowed handicapped students to explore new possibilities for individual expression, created opportunities for interaction with non-handicapped peers, encouraged teamwork, and promoted creative problem-solving. According to teachers and artists, the program has helped students to develop creative thinking skills, has enhanced their self-esteem and confidence, and has made them more willing to take risks necessary to grow. In addition, teachers have reported improved student academic performance as a direct result of participation in the project. One educator recently commented:

"The students have a new kind of control over their environment. Much of the time, things happen to them - now they feel they can make things happen."

This project not only provides handicapped children with a rare opportunity to express themselves artistically, but has helped to create a new awareness -- in the school system and in the general public -- of the potential for arts education for handicapped students. The non-handicapped peers who participate in the students' projects have also benefitted, by developing a better understanding of these students and their needs.

Note: Worksheets used are reprinted with permission from Strategies for Media Literacy, a non-profit organization that promotes media studies across the curriculum.

**Robin Clark-Winright**

Robin Clark-Winright is currently awaiting award of her Ph.D. in Fine Arts from Texas Tech University and is employed as an Assistant Professor of Art Education at Indiana University of Pennsylvania, Indiana, PA. Her professional teaching experience includes work with pre-school, elementary, junior high, high school, Adult Education, and university students in a variety of settings both in Texas and in Michigan. Ms. Clark-Winright has also worked extensively with children and teenagers, disabled and otherwise, in a volunteer capacity for the past 20 years. In addition, she is a published researcher and artist as well as a member of numerous professional organizations related to the arts and education.

# ART + AFFIRMATION = ACTUALIZATION

Dr. Robin Clark-Winright

Stop for a minute, Joe and Jane, and take a look around you at the people and/or things that make up the little slice of your world sometimes known as "the immediate environment." Philosopher Nelson Goodman (1978) says that your immediate environment as well as the rest of the world is a mental construction. The building of your world has occurred gradually over your lifetime in a sort of patchwork fashion, its pieces having been taken from the worlds of others and/or created from your own perceptions and experiences. And, what's more, no matter what your age or situation, your world is not static--it should still be expanding and contracting!

Goodman claims that our friends, Joe and Jane, also maintain a complex variety of "world versions"--for instance, their versions of the world while at school may be radically different from their home versions (Bruner, 1986). Within each of Joe's or Jane's assorted world versions, the role of "self" may also be perceived differently, and accordingly personal behaviors within those versions may tend to vary (e.g., Joe may seem like a completely different person at school, compared to the way he acts at home).

In fact, what the world "is" for Joe, Jane, or any of us, is a set of personal beliefs, attitudes, values, and assumptions regarding our own perceptual experiences and the experiences of others. Often, faulty assumptions about ourselves and others lead us to formulate inaccurate beliefs, unhealthy attitudes, and/or inappropriate values, which in turn shape our worlds and color our responses. To strengthen weak self-concepts and/or remodel impaired worlds, something must occur in our range of experiences which thoroughly challenges or tests those faulty assumptions, beliefs, attitudes, and values. Rather than leave the advent of such challenging experiences to chance, art teachers can sensitively, responsibly, and effectively set the process in motion within the worlds of their secondary school students.

## Using Art

Students frequently protest their lack of "ideas" when it comes to producing an artwork. Most often, the problem is that they think they have nothing important or personally meaningful to "say." Behaviors such as these are usually symptomatic of immature perspectives on self and the world. For example, when the values Jane adopts as her own have little or no personal significance for

her, she is not often motivated to express them either verbally or visually. Successful artists have traditionally been those who are strongly motivated and/or inspired by aspects of both their internal and external worlds, and who have developed skills in a medium well suited as a vehicle for their artistic expressions. Students, then, not only need chances to develop strong skills in using art media, but also need meaningful inter/intrapersonal experiences to spark or spur personal motivation, providing them with a rich source of "ideas" for visual expression (Bruner, 1990; Lowenfeld, 1982).

Typically, art classes have furnished the individual a reasonable degree of satisfaction by affording him/her opportunities for personal interaction with materials. Getting students to "play" with or explore art materials is usually not difficult; however, that is not enough. Students often need stronger encouragement to dig deep within themselves for expressions of the feelings and beliefs which fuel their personal worlds. To facilitate deeper explorations of one's self and one's world, art teachers can empower students through establishment of a set of "non-rules". Non-rules are those which promote divergent behaviors. In many other subjects, students are required to think convergently--for instance, math is of little value to us if we cannot all successfully arrive at the same answer for 2 + 2. On the other hand, in art class the opposite is true, highly individualized expressions are valued--in fact, the more divergent and personal Joe's artistic solution, the better. An example of a non-rule in art which can promote and encourage divergent student activity might be: "Take a chance--there are no right and wrong answers when making art."

Art projects should be carefully structured to foster individual student introspection and to cultivate personal expression in a medium. An example of such a project might be the assignment of a photo montage/collage to be done on the subject of "Me in My World". In the assignment, students are required to confine their work to a very small space (4" x 4"), forcing them to think critically about their personal values and then to reduce those values to a set of simple symbols for aspects of self and world. Such a project deliberately promotes Jane's internal scrutiny and divergent thinking by causing her to reflect deeply on the question: Who is the essential "me"?

## Adding Affirmation

When someone accurately recognizes and publicly acknowledges another person's unrealized potential or ability in some area, he/she has employed the affirmation

process. Many times others can more easily "see" within us those qualities that we cannot. Because this is true, we sometimes walk away from receipt of an affirmation questioning the motives of the one who did the affirming. It is at this point that the true power of affirmation is felt--as when Jane is compelled to compare negative beliefs about herself and/or the world with how others perceive her and her abilities.

David Elkind (1974) tells us that teenagers frequently harbor "assumptive realities" in which they falsely assume the world to be some particular way or another and then live and behave as though it were so. Until or unless some event occurs to burst this illusory bubble, those untested assumptive realities continue to act as the foundations for their owners' worlds. When affirmations encounter assumptive realities, an element of doubt is introduced which causes Joe (as the receiver of the affirmation) to reexamine his beliefs in light of the new information about self and/or the world and subsequently entertain adjustments to them.

There are several very important characteristics of successful affirmations: sincerity, unconditionality, surprise, and specificity (Trang & Clark-Winright, 1987). Affirmations are not casual compliments, delivered simply to please the receiver. The person who affirms another should sincerely believe the message he/she sends out. Sincerity presupposes unconditionality--there must be no undermining, hidden motive for sending an affirmation. Surprise serves as an effective strategy for breaking through the established defenses of the receiver. An unexpected and/or unsolicited affirmation is more likely to be believed, because the receiver played no self-serving role in causing it to occur. To be convincing, affirmations should deal in specifics, not generalities. Very general remarks do not tend to hit anything more than very general targets (e.g., "That's very nice work, Joe"). The content of affirmations should be highly personal and, therefore, must be custom tailored to fit both the uniqueness of the individual and the circumstances (e.g., "The way you have subtly combined textures and shapes is remarkable, Jane").

The nature and quality of the teacher/student relationship is at the very heart of all learning. In an atmosphere of psychological safety, students are not afraid to take healthy risks and explore the foundations of their "selves" and worlds. Such a classroom environment provides the ideal setting for delivery of affirmations specifically aimed at causing students to reexamine personal belief systems and/or test their assumptive realities. The art classroom is particularly conducive to such personal reexaminations, and also to

visual articulation and expression of the personal struggles involved in the process. As students begin this clarification process, they gradually discover things they want to "say" with their artwork. Lack of "ideas" becomes less of a problem for them, and the things they are "saying" are those things which are meaningful, individualized statements, backed up by a firm set of personal beliefs and values.

## Arriving at Actualization

As students move toward clearer thinking and firmer beliefs, they become actualized or motivated to realize latent potentials. A strong self-concept and coherent world perspective are essentials to the occurrence of actualization (Beane & Lipka, 1984; Csikszentmihalyi, 1990). Without these two ingredients, students may continue to live within their flawed assumptive realities and may even grow to reach adulthood without ever having put some of them to the test. Art can provide an exceptional vehicle for challenging those false assumptions, for expressing the personal struggles involved in restructuring belief systems, and for motivating students toward actualization of potentials.

Art teachers can carefully consider each student's strengths and how best to affirm those abilities (paying special attention to sincerity, unconditionality, surprise, and specificity within the process). This requires a great deal of insight into the individual student's needs and perceptions. Getting to know our students as individuals and cultivating solid teacher/student relationships comprise the first step toward creating opportunities to positively affect the worlds of Joe and Jane. Not surprisingly, assisting them in the actualization of personal potentials tends to result in teacher actualization as well!

Author's note: This paper (as well as its corresponding presentation) was an outgrowth of a co-authored article (with Dr. Myron L. Trang, Professor of Education at Ferrum College, Ferrum, Virginia) which is currently submitted to a professional journal in view of publication (Clark & Trang, 1990).

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**Dale Fuchs**

Dale Fuchs has been an elementary art specialist for 17 years in the Coleman, WI Public Schools. He has a strong personal interest in applications of the computer to the visual arts. He also holds the WI Adaptive Education/Art Teacher Certification and has worked for four years with the Young Artist Workshops and the Assistive Technology Research Project at St. Norbert College, De Pere, WI. His duties have included assistant lead teacher, computer lab arts specialist, and art specialist for youth with physical limitations, cognitive disorders, and severe/profound handicaps.

# BENEFITS OF ADAPTIVE TECHNOLOGY: A PERSONAL VIEW

Dale Fuchs

Based on the fact that I have spent part of my last three summers working, in various capacities, with the students enrolled in the Young Artist Workshops, a program for students with exceptional educational needs, at St. Norbert College, in De Pere, Wisconsin, I have been asked to reflect on thoughts and feelings experienced while helping students learn to use adaptive technology.

Adaptive Technology is: "any device that will enable the physically or mentally challenged individual to accomplish tasks or express themselves in ways and by means that are not usually considered accessible to them." To many people the words adaptive technology conjure up images of expensive, highly technical equipment. This, however, is not always the case. A simple piece of masking tape used to attach a paintbrush or pencil to a student's hand can validly be considered a form of adaptive technology. Such simple devices can be just as effective as some high tech apparatus, and because of their low cost and easy availability, they probably benefit more individuals than more expensive equipment does. I have used both types of adaptive devices and have seen both instill the same sense of accomplishment in the students.

Just what does the ability to use adaptive technology do for a physically or mentally challenged individual? The answer to this question probably cannot be answered accurately by anyone other than the individual undergoing the experience. All another person can do is speculate on what is going on within this individual based on what is observed and on what the observer feels he/she may experience in a similar situation. At this point, I will attempt to relate what the students I worked with may have felt upon using adaptive technology based on the above factors.

For a moment, I would like the readers of this article to move back to a time when they had a thought or a feeling that they desperately wished to communicate to someone; but for some reason, they just could not bring themselves to do it. Perhaps for the reader, as for myself, it may have been the first time that you realized your feelings for the significant other in your life. You desperately wanted to tell him/her how you felt, but for various reasons you couldn't bring yourself to do it. Perhaps for the reader the scenario was slightly different, but try to recall the feeling of frustration that overwhelmed you at that moment. Even though it seemed that the frustration would never end, deep down we knew that

somewhere within ourselves we had the ability to overcome this situation and put an end to the feelings of frustration.

Now try to imagine that through no fault of your own, you could not communicate these or other thoughts and feelings to other people. Try to simulate the anguish caused by the knowledge that there was no way to release the feelings of frustration building inside of you.

Now think about what feelings you might experience if someone suddenly gave you a way to do what you believed was impossible - a means to express yourself and to communicate with others. Try to feel the doubts, and then the unsure anticipation, as you make the first hesitant attempt at making yourself understood. Then try to experience the release of pent-up frustrations and the feelings of joy and happiness that accompany this release. This may give the reader a little insight into what adaptive technology is capable of offering to the individuals it was designed to serve.

The reader may reasonably ask how I can tell that a physically or mentally challenged individual really feels these emotions. To tell the truth, I can't with any certainty. But I believe this is how I would feel in this situation and I believe this is what I observed happening within one of the students I worked with during the three years I was in the Young Artist Workshops program.

This student was a young man who happens to have Cerebral Palsy, but in spite of this always had a smile on his face and was always enthusiastic about everything he attempted. During my first year in the program I watched this young man use a head pointer and hand brace to work on art projects and use his communication board. During the second year I enjoyed working with him on the computer and watched him use drawing and writing programs by working with a unicorn board. Through all these experiences the smile remained on his face, but when he tried to communicate with me by using his communication board, even though the smile was there I could sense the frustration emanate from him when I had a difficult time understanding what he was trying to communicate to me. I did not get to work with this student this year, but I did see him shortly before the program began and discovered that he had received a TouchTalker since the last time I had seen him. Words cannot adequately describe the feelings of joy that I felt when he used his TouchTalker to sing songs and tell jokes. But the most moving experience of all was when he and a young female friend talked to each other with their TouchTalkers. It was while watching these two events take place that I

realized there truly are different levels or degrees of a smile. I had always seen a smile on this young man's face, but the smile on his face while he used his TouchTalker had to be the highest level of smile possible. The expression of joy and total lack of frustration exhibited in this smile was absolutely beautiful. Anyone who has ever experienced this type of smile never will have to ask if adaptive technology is a worthwhile pursuit; he or she will instinctively know that it is. My wish is that every person will someday be blessed enough to experience this smile both on the face of another person, and even more so on his or her own face.

This is the most memorable of the experiences I have had while working with physically and mentally challenged students, and I am sure that every person who has ever had the privilege of working with an exceptional education need student will be able to relate enough exciting experiences to fill many volumes of books. I have no doubts that each experience will reflect the excitement, joy, and happiness exhibited by each student who uses adaptive technology. In most cases, the people who helped these students learn how to use this technology will somehow, either consciously or unconsciously, experience the unique feeling of a balance of pride and humility that comes through this type of experience. You cannot experience the emotions of these students without feeling a sense of pride that you were in a small way instrumental in helping them fulfill basic needs that are a part of the makeup of all mankind. There is also the sense of pride that one feels when he/she realizes that they are a part of a larger group working together to make life a little easier for some of their fellow human beings. But no matter how prideful we become this experience also tempers the pride with humility. By observing the struggles of the students one cannot help but realize how fragile the mind and body of a human being actually are and how fortunate he/she is not to have to deal with the challenges these students have to live with every day. Sometimes seeing what these students accomplish causes me to feel a little guilty that I am not doing more with my life.

Up to now this article has dealt with the benefits received by physically and mentally challenged individuals, but there is one other individual who has benefitted by working with this technology.

This individual is not physically or mentally challenged in any way. He is a teacher in reasonably good shape for a person of his age, and many would assume that he leads a very good life. Based on the above description, one might wonder how adaptive technology could possibly

benefit this person. If one goes by the premise that adaptive technology helps a person release and express feelings and emotions that cannot be released in any other way, then adaptive technology has definitely benefitted this individual. I guess we could say that this individual had a spiritual challenge that needed to be dealt with. From young on, this individual had developed the philosophy that one does not reveal one's emotions and does not get too involved with other people. So gradually he reached a point where he never learned to release his emotions. And just as physical or mental impairment prevents a person from developing his/her full potential, this inability to express emotion was inhibiting this individual's spirit from truly growing. This attitude was most noticeable in his interaction with his peers and his students. His method of teaching could, at best, be described as very formal, and his attitude with others could have been considered aloof. As much as he wanted to interact more with people, he was convinced that one had to be careful not to get too involved, and while not being rude, had to maintain a buffer between himself and others.

He began to believe that everyone else looked at life in the same manner that he did. Then at one point he developed an interest in computers and began looking for computer courses to take. He went to a workshop on adaptive technology for the computer through which he got involved with a program called the Young Artist Workshops where he discovered that it was not only all right to care about and get involved with people, but also that because of the nature of the students involved in the program and their need for individual attention it was impossible not to get emotionally involved. He slowly began to realize that for most of his life it was as if he had been a caterpillar in a cocoon; but as he got more involved with students who really needed a total commitment from him he discovered that his cocoon had cracked and that for the first time in his life he was soaring like a butterfly. He had found a place that forced him to commit all his energies and emotion toward someone rather than keeping them locked away inside. Today, this teacher takes more of an interest in his students, is becoming more involved with them and their lives, and is no longer leery about reaching out to other people. For this individual it was not the need to use adaptive technology for himself that allowed him to begin to express his emotions and to begin to allow his spirit to mature and grow, but it was the fact that by showing others new ways to release and communicate their emotions and feelings he was finally able to open up to others and express his emotions and feelings. In the final analysis, this individual got as much benefit from adaptive technology, or more, than did his students.

In this case, unlike the others, I am not speculating as to how others felt. I know these feelings intimately because I am that individual.

# Intro to Introtalker

Julie Hoover

The Introtalker is a simple battery-powered speech output communication device for people who are nonspeaking. It was designed for use as an evaluation tool, introductory device, or a communication aid for persons with limited needs. It has been used successfully by individuals with a wide range of disabilities, such as cerebral palsy, mental retardation, and autism.

There are three different types of IntroTalkers: the standard IntroTalker, the Scanning IntroTalker, and the Remote Switch IntroTalker. All can be used with either an 8 or 32 location keyguard. The 32 location keyguard has four rows of eight keys, each measuring approximately one and one-half inches square. The 8 location keyguard provides two rows of four squares, each measuring just over two and a half inches. IntroTalkers come in beige, blue, or red.

The standard IntroTalker is activated by pressing directly on the keys using the fingers or some type of adaptive pointer. It requires only four ounces of pressure to activate.

The Scanning IntroTalker is designed for those who cannot access a standard keyboard. It can be used with any standard single switch. There are three different scanning modes: 32-location row-column, 8-location circular, and 8-location count. The scanning rate is adjustable.

The Remote Switch IntroTalker has all the features of the standard IntroTalker. In addition, it has eight switch jacks into which standard single switches can be interfaces. Each of the jacks corresponds to a single location on the 8-location overlay. When a switch is activated, the message in its corresponding location will be spoken. This is especially useful for individuals who do not yet have the ability to scan and for whom direct selection is difficult. It is also beneficial for people who have attentional or visual difficulties.

The IntroTalker is easily programmed in any language by a speaking person using the built-in microphone. Grouping and programming vocabulary according to different "themes" or activities provides for greater power and flexibility. For example, if the user enjoys playing "Simon Says," all the vocabulary corresponding to that game could be programmed to begin with the same key. "Simon says clap your hands" could be programmed using a two-key sequence of BOY - HANDS. In this example, the

first key signifies Simon says, the second the specific action requested. "Simon says lie down" could be represented by BOY - LAY.

Many users functioning at this level would have difficulty making a two-key choice. However, the special function of "Set One Symbol Theme" would allow the system manager to lock in the BOY key. This would be analogous to using a caps lock key on a typewriter whereby you would no longer be obligated to press the shift key prior to producing the next capitol letter.

In the "Simon Says" example, the user would only need to select those single keys combining with BOY. By programming in this manner when using an 8 location overlay, the IntroTalker user would have access to 64 (i.e., 8 x 8) single key messages rather than only eight. This is accomplished since the first key combines with itself, the second key, the third and so on. By locking in the first key, the user needs only to press the combining keys. In the same manner, the second key combines with the first, second, and third and so on and can also be locked in. When using a 32 location overlay in this manner, there would be 1,024 possible single key combinations. Imagine the power!

All IntroTalkers allow for one to two minutes of recorded speech. By adding up to three additional memory modules, this can be expanded to four to eight minutes. The amount of recording time depends upon whether the machine is set to standard or extended speech. Standard speech provides for a higher quality recording but less overall time. One minute provides enough time to record approximately 120 words or about 30 short phrases.

Many creative applications have been developed for the IntroTalker. For users who have visual impairments, puff paints can be used on the overlay to add texture. The brown keyguard could also be covered with yellow electrical tape. To facilitate interaction and choice-making snacktime, the overlay could contain pictures of the user's classmates and the snack choices. Each member of the class could pick a snack choice, and then the IntroTalker could be passed to the next class member.

The IntroTalker is a simple, yet powerful, augmentative communication system. For some, it will be the only communication device ever needed. For others, it will develop the foundation skills necessary for successful use of a more powerful augmentative communication system.

For further information, please contact:

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## If You Can Move Your Head...HeadMaster!

Julie Hoover

"If you can move your head...you can move your world" is a fitting description of the HeadMaster from Prentke Romich Company. The HeadMaster was designed for individuals who are unable to use their hands and, therefore, unable to operate a standard computer keyboard and "mouse." It is compatible with Apple, IBM, and PC Compatible computers and most standard software programs. Successful users have been individuals with a variety of disabilities including spinal cord injury and muscular dystrophy.

The HeadMaster user wears a small, lightweight headset consisting of three ultrasonic transmitters, which receive signals from a control unit sitting atop the computer. The control unit is designed to measure the change in the angular position of the headset. This is done hundreds of times per second. These measurements are then translated into cursor commands. Therefore, as the user moves his or her head, the cursor moves in the corresponding direction on the computer screen.

The HeadMaster has six different sensitivity settings which can be varied based upon the user's head control and experience. Once the cursor is pointing to a specific target, the "click" function of the mouse can be accomplished either by puffing into a tube attached to the headset or by activating a single switch. The method used will be dependent upon the user's physical abilities.

A variety of special software programs have been written for the HeadMaster. ScreenKeys is one such program developed by Berkeley System Design, Inc. This Macintosh desk accessory allows an image of the QWERTY keyboard to be displayed on the computer screen. The user may "click" on specific keys either by activating a switch or by leaving the cursor on a target area for a set amount of time. This time window is adjustable. System 4.1/Finder 5.5 or greater and a hard drive are required.

Wordwriter is another Macintosh desk accessory. It is compatible with standard application programs, including HyperCard. It has two different sizes of keyboard windows to choose from. It has a word prediction dictionary containing over 4,000 words. Word prediction allows the user to see and select from a menu of words beginning with the letter or letters he or she types. For example, if the user were to type the letter "b", he or she would see word choices which begin with that letter. By selecting from this menu, the user would not

need to continue typing the rest of the word.

ScreenDoors is another program for the Macintosh. It runs with most Macintosh applications under MultiFinder. ScreenDoors allows for both alphabetical and QWERTY keyboard arrangements and also has word prediction. It requires MultiFinder System 6.03 or later and 2 MB of RAM.

IBM and PC Compatible software programs include HandiKEY Deluxe and WiVik. HandiKEY Deluxe works with MS-DOS and allows for joystick entry as well as mouse input. Its word prediction system is designed to learn the words most frequently used by the user.

WiViK is designed for use with Microsoft Windows 3.0. WiViK stands for "Windows Visual Keyboard." Users can create their own keyboards and include special macros or other text. A variety of on-screen keyboards come with the program, including some used in other countries!

With this international application in mind, it is easy to see how the HeadMaster truly can allow persons to move their world, if not the whole world. Through the use of standard wordprocessing, spreadsheet, data base, and game programs, the computer world is accessible even to those who cannot use their hands. As some would say, now that's really using your head!!!

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## Let MAPS Lead Your Way

Julie Hoover

Minspeak Application Programs, or MAPS, are vocabulary programs written for specific populations of people who are nonspeaking. Each provides a starter set of words, phrases, and sentences which are meant to be customized to meet the individual needs of the augmentative communication system user. MAPS are compatible with both the TouchTalker and LightTalker from Prentke-Romich Company. They are quickly and easily loaded into these devices by using computer chips.

MAPS provide many benefits. Having an extensive vocabulary available to quickly load into an augmentative communication device saves the system manager untold hours of vocabulary planning, selection, and programming time. Thus, the system becomes more functional for the user at an earlier time. Each MAP is designed for a specific group of augmentative communication users by an author who has extensive background and expertise in working with that population. This too can be a great time saver for the system manager who may not be so familiar with the vocabulary needs of a specific type of user.

Power in Play, authored by speech-language pathologist Gail Van Tatenhove CC-SLP, is designed for preschool children who are nonspeaking and who function cognitively and linguistically at the 3-5 year old level. There are no cognitive prerequisites to this program. It is designed to allow children to experience the fun and power of communication through the use of an augmentative communication system. It is not, however, meant to provide for all of the child's communication needs.

The Power in Play program contains seven, 8-location overlays. Each location on the overlay measures more than two and one-half inches square. System managers are encouraged to customize their own overlays as well. The vocabulary includes topics such as saying good-night to family members, exchanging personal information, and playing Simon Says.

Interaction, Education & Play Plus, was developed by speech-language pathologist Dr. Joan Bruno for use with young children and teens who are nonspeaking. This vocabulary program contains approximately 1000 words, 200 phrases, and 100 sentences. The interactive section provides vocabulary useful for social exchange, initiating conversation, making requests, protesting, and asking for clarification. Some examples include: "I'm telling mommy on you" and "What I'm trying to say is not

stored in my Talker."

The educational vocabulary allows for student participation in subjects such as math, reading, phonics, and social science. The play section features highly motivating rhymes, riddles, jokes, songs, and play dialogues. Several story books are programmed into this MAP to allow the users to read to themselves, their peers, siblings and/or parents.

Language, Learning and Living, authored by Tony Jones of Mansfield, England,and Americanized by speech-language pathologist Sheryl Haeusler, contains over 3,500 preprogrammed words, phrases, and sentences. It is designed for adolescents and adults who have developmental delays and other associated learning difficulties. It consists primarily of single words and short phrases. Its large noun vocabulary allows for a rich, concrete language base. As with all MAPS, it is not necessary for the user to have reading skills in order to be successful with the program.

A very creative learning approach is suggested for use with this MAP. It involves teaching system users about the personality of the pictures which represent various parts of speech. For example, "Thelma words" are those beginning with "th". "Dan words" are those which "Describe A Noun" or adjectives.

Word Strategy was authored by linguist Bruce R. Baker, AM. It contains a core of over 2,500 words and phrases. It allows the system users to communicate specific information without having to spell each word they wish to communicate. The number of key strokes required to represent each word and phrase represents a 66%-75% reduction in key activations over spelling. Thus, the system user can communicate more information in less time.

A combination of grammar labels (e.g. verb, +s, noun, adjective) and pictures are represented on the overlay. Each core word within this vocabulary set has a variety of forms. For example, a picture of an apple is combined with the various verb forms to produce eat, eats, eating, ate, eaten, and to eat. Thus, a picture is virtually worth a thousand words!

Minspeak Application Programs can lead your way down the path of vocabulary selection and customization. Let them be your guide!

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# MOUSING AROUND

Mary Trieschmann
Unicorn Engineering

The computer is a magical new tool for young artists, allowing them to easily explore the world of creating. Unfortunately, most of the art programs available use a mouse or the standard keyboard, two devices which are often difficult for disabled children to use. *Mousing Around* was developed in response to this problem. By using the Unicorn Expanded Keyboard and Adaptive Firmware Card™, people with disabilities can now access dozens of painting and drawing programs. It lets them concentrate on creating art rather than moving a mouse. It makes art easy and fun.

With *Mousing Around*, a disabled person can easily design pictures with *Paintworks Plus*™ and *Dazzle Draw*™. Touch a rectangle on the Unicorn Keyboard and a rectangle appears on the screen. Color the rectangle, change the background, or erase the entire picture simply by touching the paint palette, paint bucket, or eraser on the Unicorn overlay. By using the new Adaptive Firmware Card technology of "mouse macros," complex sequences in the software have been simplified into one-step processes, giving new power and success to the Unicorn user. In this way, *Mousing Around* provides a new level of physical and cognitive access to software previously too challenging to many people with disabilities.

*Mousing Around* also makes it possible to color between the lines! (Not an easy accomplishment for many people with physical impairments.) With *Mousing Around*, the user employs a special setup and overlay designed for a software series called *Electric Crayon*™. She or he chooses a picture from a collection of holiday, animal, or dinosaur scenes. Simply touching Santa, and then touching red, turns Santa red. Touching the pig and then the color pink, turns the pig pink. Coloring has never been easier.

*Mousing Around* opens the world of "living story books" to the Unicorn user. The *Explore-A-Story*™ software series creates scenes ranging from science themes such as deserts and underwater scenes, to classic stories such as "The Three Little Pigs" and "The Princess and the Pea." With *Mousing Around*'s "Explore-A" overlay placed on the Unicorn Keyboard, the user can add characters and objects to the scene, change the background, place prewritten words in the scene, print and save to disk, all by touching squares on the Unicorn Keyboard.

*Mousing Around* includes two disks (one 3.5" and one 5.25") and five, full-color overlays. One overlay works with the *Electric Crayon* series, a second overlay works with the *Explore-A* series (including *Explore-A-Story*, *Explore-A-Science*, and *Explore-A-Classisc*), and a third overlay works with the *Paintworks Plus* and *Dazzle Draw* paint and draw programs. Two overlays work in a more generic way with any mouse-driven software, such as the *Pelican Creative Writing*™ series, *McGee*™, Katie's Farm™, and the *Children's Writing and Publishing Center*™.

*Mousing Around* runs on an Apple® IIGS or IIe (128K enhanced) computer with an Adaptive Firmware Card Model G32 or G32e. The suggested retail price is $99.95. *Paintworks Plus, Dazzle Draw, Electric Crayon, Explore-A* software and other compatible programs must be purchased separately. For information on *Mousing Around* and other Unicorn Engineering products, write or call Unicorn Engineering, Inc., 5221 Central Avenue, Suite 205, Richmond, California 94804, 800-899-6687 in the USA or 510-528-0670.

# DYNAMIC DISPLAY DEVICES AND THEIR POTENTIAL FOR MEETING A VARIETY OF COMMUNICATION NEEDS

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Adaptive Communication Systems, Inc.

Dynamic display devices refer to augmentative and alternative communication (AAC) systems which utilize computerized displays for representing communication symbols, letters, pictures, or icons. Another salient feature of dynamic display devices (DDDs) is their ability to instantly change the display either under the user's control or as a function of preprogrammed algorithms. These devices can take the form of either computer software for existing computer systems or dedicated hardware-software packages.

Previously encoding considerations have been influenced by limitations of the communication devices on which they were being implemented. The development level systems, picture sequencing schemes, and semantic compaction grew out of the need to represent more than the 128 utterances which could be represented on our earlier communication devices. Because DDDs are capable of instantly changing displays or "overlays" at the command of the user, they draw upon cognitively lower skills such as categorization. With DDDs, multiple overlay systems can be arranged categorically, randomly, linguistically, alphabetically, or hierarchically. This flexibility enables the clinician to develop unique systems for the individual rather than forcing the individual to conform to the limitations of the device. Moving icons could potentially enable young children to recognize verb and preposition forms by giving them action and reducing the dependence on interpreting action marks, perspective, position, or printed captions. Since DDDs derive their functions from software, changing software enables the clinician to utilize the system for a variety of clients. The same device can be used as the subject moves from picture-based systems to orthography, thus reducing the cost for the client, evaluation center, or clinician.

The DynaVox represents a dramatic step forward in the development of DDDs. Its processing speed, large memory capacity, DecTalk synthesizer, and advanced software make it a very flexible communication device. Unlike other systems which are composed of retrofitted components, the DynaVox is a single unit consisting of a synthesizer, screen (which displays keyboards, pictures, and programming function and controls) and interfaces. The quality of the high-resolution graphics enables us to represent language more effectively by including pictures capable of meaning modulation rather than simple

representation.

The DynaVox is also capable of digitized speech and music recording for playback by the user. A variety of input methods are available. These input methods include touch screen (touch enter and touch exit), scanning (with more than 14 different patterns), audio scanning, mouse, joystick, track ball, and multiple switches. In addition to standard switches, the screen itself can also be used as a switch during scanning.

In summary, the DynaVox represents the application of modern technology to a dedicated, self-contained communication device capable of being used with the full gamut of users. Because it is designed specifically for the task, the DynaVox is easy to use and extremely flexible in its ability to represent a variety of language encoding methods. Its built-in ten voice synthesizer makes it ideal for male, female, and young users.

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Unicorn Engineering
Wisconsin Department of Public Instruction
Young Artist Workshops/St. Norbert College

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